the teaching of

PATHOLOGY

MICROBIOLOGY

IMMUNOLOGY

GENETICS

Report of the
Second Teaching Institute
Association of American Medical Colleges
French Lick, October 10-15, 1954

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Report of the Second Teaching Institute
Association of American Medical Colleges
French Lick, Indiana, October 10-15, 1954

The teaching of

Pathology • Microbiology
Immunology • Genetics

This report was compiled by committee with the editorial assistance of

LURA STREET JACKSON

Association of American Medical Colleges

1955

"Faith, Gospel, all, seem'd made to be disputed,
And none had sense enough to be confuted."

ALEXANDER POPE

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ASSOCIATION OF AMERICAN MEDICAL COLLEGES

Preface

". . . the rung of a ladder was never meant to rest upon, but only to hold a man's foot long enough to enable him to put the other somewhat higher."
THOMAS HENRY HUXLEY

THE OBSERVATION WAS MADE at the second Teaching Institute that all too often medical education is to the medical student what ornithology is to the birds. While offered lightly, this thought has a greater degree of significance than many of us would care to admit. To the extent that medical education has evolved as something *apart* from the student, it is not meeting its potential. When the educational experience fails to foster the student's growth and maturation, medical education tends to become vocational training.

Professional education in medicine has been at its best an important part of the liberal university tradition—it can only be at its best when it is. As many of the participants at the Institute emphasized, it is being infiltrated today by the spirit of the trade school. More and more, it was felt, the doctor is becoming the expert technician in superb command of his tools and methods but one who has banked the fires that illuminate his learning. An intensive exploration of the learning process describes best, perhaps, what was the principal concern of the 126 participants at the second Teaching Institute, which dealt with "Pathology, Microbiology, Immunology and Genetics," at French Lick, Ind., last October. To the enduring credit of these participants, their discussions generated both heat and light—few fires were banked.

In examining a coin of the realm, one must look at either the *obverse* or the *reverse*. To permit me to comment on what I believe was the substance of the French Lick "faculty meeting," I shall designate the obverse of our educational coin as the *learning process*, for the obverse bears the main design. The reverse I shall call the *teaching process*. They are as inextricably a part of the same thing as are the two faces of a coin.

The learning process. Focusing on the learning process as the central objective in an intensive examination of medical education, delineates the goal of the Association's present series of six Teaching Institutes. A conviction that a spirit to re-evaluate our basic tenets was stirring in medical schools throughout the nation led me in 1952 to write "Medical Education in Transition," a paper in which a role for the Teaching Institutes was projected. The zeal of the participants, most of them teachers of pathology

and bacteriology, stemmed from their profound concern that they must design more fruitful educational opportunities for their students. Yet at the same time they appreciated that it is always easier to idealize problems than to solve them. Capitalizing on the momentum of the first Institute, the second Institute at French Lick again provided a mechanism for teachers to tackle jointly problems found to be more widespread in medical schools than had been generally appreciated. Exchanging experiences, describing new ventures, defending cherished programs, analyzing ways of doing things that are different—all in a sustained effort to learn to do one's teaching job better—this was the day-to-day accomplishment of the Institute.

The microbiologists, oriented as many of them are toward an experimental attack on the dynamics of the host-parasite relationship, which has stimulated the vigorous march of bacteriology and immunology in recent decades, exerted one of the most significant influences on the participants' thinking. Their broad biological point of view set the pattern for much of the constructive discussion at the Institute. Inevitably concerned with modifications in the host as well as in the parasite and with the role of variation in the mechanisms of infection and resistance, the bacteriologists and immunologists are welcoming the geneticist into their departmental research and teaching activities. They threw strong support behind the few geneticists present at French Lick, who showed lucidly what genetics can mean to medical education. Much is owed to these few. Their contribution engendered a wide appreciation that genetics should occupy a larger place in the medical school setting. For the medical student, this would lead to a fuller comprehension of man. It would reveal for the physician another vector in the interplay of the forces involved in any instance of disease. Here came to light new challenges to faculties of medicine. These challenges are being accepted—since the Institute at least six schools are actively developing programs in medical genetics.

From many pathologists came strong expressions of conviction that dynamic pathology, with its accent on the constantly changing variables that make up both healthy and diseased states, offers the most fertile approach to understanding the human organism. And to the student's creative faculties, too. Why? Because this kind of focus inevitably shifts the emphasis toward the solution of problems and away from the description of morphological appearances. To express this conviction is merely to restate Virchow's famous *dictum* that disease is life under altered conditions. More than a century ago he recognized what has been all too frequently neglected since his time, namely the ultimate sterility of preoccupation with the structural changes incident to disease processes. Recapturing the invaluable contribution of dynamic pathology, the participants achieved an orientation best described as a more integrated concept of the biological nature of man. It is the pathologist himself, therefore, who is attempting again in the spirit of Virchow to revitalize the teaching of pathology by fusing structural and functional concepts in a more comprehensive view of disease. The excite-

ment of the pathologists in examining the validity of this approach raised the whole level of the Institute.

Viewing the host-parasite relationship against a backdrop of the interplay of genetic and immunological forces and understanding disease in terms of pathological physiology builds for the medical student a fresh and vital setting. Here his curiosity has freer rein; here ferreting out answers to provocative questions activates the learning process and plumbs the depths of the student's intellectual resources.

Student and teacher. All of this presupposes an imaginative and mature student, one who has the capacity to engage in a *participating relationship* with his teacher. The teacher, too, must be imaginative and mature. Just as the success of the Institute depended upon the participating activities of teachers, so the success of the teaching enterprise at the undergraduate level —or at any other—is directly related to the contributions of the student. The creative response of the student, therefore, is a function both of the environment that the teacher helps to fabricate—one that inspires original thinking —and of the potential of the medical candidate.

Medical parochialism, contributing as it must to professional vocationalism, tends also to make the study of medicine less stimulating and attractive to superior college students. Thus, there are not only fewer applicants, but fewer of the type the good teacher likes particularly to gather around him: the well-rounded and versatile candidate who has not yet become a specialist in his outlook. At the Institute, the participants were much concerned that the ratio between the available positions in the freshman class in the medical schools and the applicants seeking these positions is approaching perilously close to 1-to-1. Some medical schools actually lack today sufficient acceptable candidates to fill their classes; Accordingly, the participants explored the interfaces between high school and college, and college and medical school, in an effort to find better ways to help students at these crucial junctures in their growth and development.

The participants also sought the means to combine the British concern for "training the natural aristocracy of talent" with the American insistence on a liberal education for everybody, a system that has undeniable benefits but one that is calculated to introduce into the educational enterprise severe stresses and strains all along the line. The problem of an *elite* in a *democracy* is a national problem, one that transcends medicine. The two words are contradictions as popularly understood, but *they are not really contradictory unless one is to assume that democracy can tolerate placing no premium on talent.* To be true to the democratic tradition, it seems to me, one must strive for an environment that is maximally conducive to the mergence of the nation's finest talent, recognizing that such talent—or creativeness, or the ability to assimilate and to re-orient ideas—springs from every point on the national landscape. In discussing this vital issue with me recently, one of the participants who had contributed richly at French Lick expressed the point very effectively as follows: " . . . democ-

racy should provide an environment maximally conducive to the development of each individual's potentialities—not equal education, but education for equally full development within the limits of the individual's capabilities."

To nurture such talent in medicine—an objective underlying the very purpose of our series of Teaching Institutes—requires the discovery and mobilization of new sources of revenue in order to stabilize the educational budgets of the medical schools. A key point, which was frequently expressed, is the correcting of the chronic financial embarrassment of the teacher—now an integral part of academic life. For that matter, the financial load carried by the student is as serious as the low salaries received by his teachers. Which leads me to the reverse of our educational coin, the problem of teachers and the teaching process.

The teaching process. Participants at the Institute soon came to realize that discussions of *teaching* and the attributes of the *good teacher* are fraught with difficulties, many of them semantic in nature. As they ventilated their hopes and fears, their ambitions and frustrations, it became apparent to all that they are dealing with a peculiarly sensitive area, one that had long clamored for attention but had not received the recognition and analysis it deserved.

Many teachers expressed concern that such a low priority is set on teaching itself, that teaching is so often regarded as an ill-fitting garment which a research worker may or may not wear with comfort. This view dictates that the weight—in pounds—of his bibliography is virtually the sole determinant of the teacher's promotion to higher academic ranks. This is an exaggerated statement of course, yet there is evidence that such is all too often the case. This concern received emphasis also at the Association's first Institute.

To the extent that many of our teachers are trapped by the rigid and arbitrary system of temporary project grants for research, their teaching suffers. Until the medical schools can provide ways to reclaim control of their budgets, the productivity of their teachers, as teachers, will continue to be curtailed. Were the schools to become again the complete masters of their economic destiny, they could view the teaching arm of their operations in a healthier perspective. Such a perspective would take into account more prominently many facets of the teaching process, of which research—or, more properly, the research viewpoint—is only one, albeit an essential one. This point was brought out again and again at French Lick as it had been at earlier Institutes.

Although the participants could not define quantitatively the precise ingredients of the *good teacher,* in the final analysis it was recognized by all that the *good teacher* turns out to be the individual who inspires his students by provoking their critical thinking. His students will be motivated to explore their teacher's ideas and those of others as they formulate their own. Such a teacher is always an enthusiastic student, with a student's

curiosity fortified by experience. His teaching is something that stems from within; such a teacher is, of very necessity, also an investigator.

A good teacher is of course much more than a clever lecturer, although the ability to articulate is not to be despised. Yet the clever lecturer is sometimes merely a virtuoso, and teaching is far more than a demonstration of prowess. To teach effectively one must understand and practice the art of communication. One must have a spirit for it, and this spirit ranges far and wide to the very frontiers of medicine. Any definition of a good teacher, therefore, that emphasizes *only* his research activities, or *only* his virtuosity in lecturing, or *only* both, is limited. He must be also a warm and imaginative human being who likes people.

Huxley's comment about the ladder, quoted at the head of this preface, comes from his address "On Medical Education" to the students of the Faculty of Medicine in University College, London. He was talking to them on May 18, 1870, on the occasion of the distribution of prizes. He had this to say about teachers:

> "What the student wants in a professor is a man who shall stand between him and the infinite diversity and variety of human knowledge, and who shall gather all that together, and extract from it that which is capable of being assimilated by the mind."

Today, Huxley might be short-sightedly accused of spoon-feeding, but "assimilation" assuredly means a great deal more than that. I personally would have preferred a picture of a teacher standing *beside* a student exploring the frontiers of knowledge, rather than the professor standing *between* the student and the infinite diversity of knowledge. Yet Huxley's point is not without merit, for he pictures the student and teacher working *together* in a mature relationship. And this is the main point.

Medical students still want from their teachers what Huxley described 85 years ago. But the phenomenal growth of medical science now precludes the encompassing by one individual of even a single medical discipline, much less the whole of medicine. It is still the professor's great responsibility and privilege, nevertheless, to guide the student in exploring in his own right the "infinite diversity and variety of human knowledge." From the impact of the good teacher and good student on each other, working together in a close relationship, there will emerge the lifelong scholar in medicine, the inspired and dedicated physician.

GEORGE PACKER BERRY, M.D.
Dean, Harvard Medical School
Chairman, Committee on
Teaching Institutes and Special Studies
Association of American Medical Colleges

Boston, Massachusetts
June 1, 1955

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Introduction

FROM OCTOBER 10 through 15, 1954, a cross section of teachers from medical schools throughout the United States and Canada gathered at the Teaching Institute at French Lick Springs Hotel to assess and re-appraise not only teaching methods but the subject matter that comprises undergraduate medical education.

This was the second of the Teaching Institutes, conceived by George Packer Berry of the Harvard Medical School[1] and held under the auspices of the Association of American Medical Colleges. As conferences on preventive medicine and psychiatry preceded this series, the Institute was actually the fifth conference on medical teaching.

The foresight of the original planners of the Institutes has been increasingly justified by intervening events. Today there is more urgency than ever to re-examine medical education in the light of its growing challenge. Concurrent with the focusing of public attention on the need for increased funds for medical schools comes need for a new appraisal of the product under discussion: the efficacy of the education offered.

The vast areas opened up by science during the last decade alone offer an unprecedented addition to the curriculum. As scientific frontiers advance, no relief can be expected; only more and more facts will be brought as grist to the mill, to be absorbed into "medical education."

Emphases too change with passing time and new discoveries such as the antibiotics, which have diverted incidence from the diseases that have chiefly afflicted mankind in the past to the new ailments which will be the preoccupation of the next years. Adjustments for these happy casualties that scientific advancement has left in its wake must be made in the medical curriculum.

The growing emphasis on preventive medicine and public health; the increased attention toward ecology in illness (those factors affecting health and well-being which stem from patterns of life and environment) and the developing stature of the role of genetics in medicine—these suggest a few of the new ingredients to be added to an already overcrowded curriculum. They will have to be dealt with, to some degree, as a part of medical education henceforth.

With far more to teach and no more time—nor any visible possibility of increasing the already arduous period of medical training—what is the answer to the medical schools' dilemma?

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1. BERRY, GEORGE PACKER. "Medical Education in Transition." *J. Med. Educ.*, 28: 17-42, March 1953.

Obviously there is no single answer, nor did the Teaching Institute propose to function as an oracle, propounding categoric truths and uniform solutions for common problems.

Its basic premise was the assumption that individuals and ideas determine the strength and growth of a society, and that only insofar as we utilize ideas and individual talent will the extraordinary advances potentially inherent in our society materialize. It aimed to combat a current tendency to bestow credit for conformity. It sought to attract the genius and talent of creative and dedicated minds to the challenging but elemental question of better medical education.

For this the Institute brought together a cross section of educators to exchange ideas. The aim was to inspire many answers—as varied as they were numerous, and adapted to different needs. In the words of the Institute chairman: its purpose was to re-examine the old and explore the new; its hope, to help generate a renaissance in the teaching of medicine.

Those who came were reminded of the broad responsibilities and province of men of medicine: that, remote as the professional medical schools have necessarily become from the aura of the liberal arts tradition, this still remains the one science that links the humanities (by philosophy and action), the empirical sciences, and the philosophy of man's limitations and his destiny.

The Institute did not seek to regiment or pass resolutions. It revealed mutual problems and turned up a multiplicity of answers devised by various schools to meet them. It flashed across the screen some of the innovations inherent in the challenge of the future in medical education.

No new paths were charted, but some of those that have been explored were shared.

The process of fermentation effected, the results will not, of course, be measured in terms as specific as blood count or rate of pulse. In this field there can be little controlled experimentation; there is place for trial and, sometimes, error.

But we have reason to believe that from such exchange of experience will emerge a heightened concern for effective teaching, and a susceptibility to change if it appears to involve improvement or better achievement of goals.

The success of the Institute will be manifest in ways subtle and concrete on many campuses in the months to come; in more open-minded evaluations; in a fresh appraisal of methods; and above all in a new eagerness to experiment, test, discard and utilize.

The Teaching Institute will have served the purpose for which it was conceived if it gives impetus to the spirit of inquiry and re-evaluation which is as essential to education as it is to medicine.

I. Objectives of Teaching

THE OBJECTIVES OF TEACHING are a major preoccupation of the teacher from his first classroom experience until the farewell ceremonies marking his retirement. Subconsciously or not, they direct his efforts and qualify his relationships with students throughout his teaching career.

The first session of the Teaching Institute, therefore, attacked the problem of defining some general objectives of teaching in the medical disciplines represented (pathology, clinical pathology, microbiology including immunology, and genetics).

This formulation of objectives was not sought, *per se*, as an end in itself, but to establish a framework within which a realistic appraisal might be made of all the components of a teaching program. Some general agreement as to basic goals would serve as a lodestar by which to plot the relative adequacy of many factors involved in medical education. It was expected that topics related to course content, techniques and methodology would receive a great deal of attention, and that many other matters involved in general education and professional training would be discussed.

General objectives of undergraduate medical education

The participants approached the problem of defining objectives in the specific disciplines represented at the Institute against a broader background of objectives of undergraduate medical education in general. Woven into the discussions was a pattern of thought similar to that developed at an earlier conference:[1] namely, that our objectives should be to help the student to: (a) acquire requisite knowledge, (b) establish essential habits, (c) achieve basic skills, (d) develop sound attitudes and (e) gain an understanding of professional and ethical principles of medicine.

Embodied in the discussions, also, was the general theme that objectives in teaching in the specific fields of study covered by the Institute should include all proper contributions to an environment that will enable a student to become an adequate physician. One discussion group, in defining an adequate physician, concluded that such a person is the more mature outgrowth of an undergraduate who has been induced to become a lifelong student of human biology and of the disturbances which may adversely affect the health of man.

1. "The Objectives of Undergraduate Medical Education." *J. Med. Educ.*, 28:57-59, March 1953.

Relevant factors

Emerging from the discussions were several concepts which bear a relation to the objectives of teaching regardless of the specific area of instruction involved.

The tradition of medicine. One of these that recurred time and again was the importance of keeping before students at all times the high tradition of medicine. All too often, it was thought, the idealism with which students are imbued before entering medical school fades under the stress of the curriculum. Teachers, absorbed in the prodigious tasks of instruction, may fail to place sufficient emphasis on the intangibles that are equally essential to the development of the physician. Consciousness of the medical tradition should permeate all teaching endeavors and should be passed along by precept and example. Students must be reminded that they are entering a learned, honorable, merciful and generous profession, and that they have an individual responsibility to help maintain the tradition of service established before them.

Faculty members face the inescapable obligation, too, of imparting to students principles of social and professional ethics and the requirement of absolute integrity in dealing with both objective and subjective data. Exemplary respect for human beings should be manifested in the autopsy. Concern for the life and comfort of animals may be similarly cultivated in the laboratory.

Student motivation. A second concept bearing on teaching objectives centered around student motivation. The importance of this factor in creating an environment favorable for learning was stressed by many discussants at the Institute. They ruefully conceded that, like idealism, motivation is frequently at its height when a student enters school and diminishes as he proceeds through medical training. Logically, it should be enhanced, and teaching efforts should be directed toward this end. Many suggestions were made as to ways in which this might be achieved.

It was recognized that motivation has a personal as well as an intellectual component. It is influenced by human relationships in general, and relationships between student and teacher in particular. A teacher's "contagious enthusiasm" may be an effective ingredient in generating high motivation.

Student interest may sometimes be enhanced by early introduction of the patient into the study of medicine. The student thus begins early to identify his relationship with the patient, and to project himself into the role of physician. It may be further increased through emphasis on the experimental approach to an evaluation of the subject matter and the introduction of case material into the teaching program. To this end students may effectively participate in examining the naturally occurring experiments that abound in the teaching hospitals, ready for exploitation and utilization by alert faculties.

It was emphasized that teachers should seek to take advantage of the motivation inherent in their own material—whether in the preclinical subjects or the clinical fields. There should be no need for the creation of an

"artificial atmosphere" to assure proper degrees of student motivation. Caution was expressed against the use of fear as a device to increase motivation. While it is possible to enhance this quality temporarily through such means as fear of examinations or punitive measures, it was agreed that such negative methods of securing student interest were improper and had little lasting value.

There was unanimity of opinion that, irrespective of method, the teacher should have before him at all times the objective of inducing and maintaining a high level of student motivation.

The scientific attitude. Another concept of importance to the realization of objectives was keeping before the student the need for critical evaluation of all information presented either in readings, lectures or laboratory exercises. Dogmatism in medical teaching should be avoided. In some discussion groups the quality to be cultivated was referred to as the "scientific attitude," and it was pointed out that the induction of a scientific attitude in the mind of a student requires the utilization of controlled experiments in the analysis of observations and of hypotheses. Others felt that the teacher could do much to instill the inquiring scientific attitude in the student through the example of his own critical evaluation of the information he presents and through the appropriate use of statistical methods of analysis of data. It was also suggested, to this end, that more experimental work be introduced into the pathology curriculum.

Teaching principles

Facts versus principles. Another topic bearing in a general way on the objectives of teaching was the relative importance of facts versus principles. It seems to have been agreed generally that, even if desirable, it would be impossible to teach all pertinent facts. Careful consideration should therefore be given in course planning to the selection and utilization of examples illustrative of the cardinal principles of the subjects taught, and the student should be encouraged to assemble, classify and associate the necessary facts as they are obtained from reading and experience.

The acquisition of sufficient basic facts was accepted as fundamental to the understanding of principles. However, some teachers may tend to overemphasize minute factual details by requiring them in examinations, much to the students' dismay. It was noted also that many students continue to request more and more factual information, probably motivated by a concern with their ability to score acceptably on examinations, both intra- and extramural.

Definition of basic principles. Discussion of the problem of teaching facts versus principles recurred throughout the Institute and focused attention on a definition of basic principles. One group concluded that among the basic principles to be taught is that of multiple causation. Other principles selected for listing were adaptive compensation to altered function or, as one conference member expressed it, the interdependence of functioning units, and the principle of recurrent phenomena, as exemplified by patterns of reaction in inflammation. After further discussion of the question of

possible differences among principles, laws, mechanisms, concepts and generalities, it was concluded that the term "basic principles" embodies almost any combination of these terms. Principles can be appreciated only in the light of specific examples, and the statement of most principles involves the explanation of various mechanisms as indispensable components.

The term "basic principle" was particularly difficult to define in such a field as pathology where so much is related to observation, description and analysis. It was the opinion of the conference members that course structure should be based insofar as is possible upon the teaching of mechanisms, concepts and principles, and that specific factual material should be carefully selected and skilfully utilized to support an understanding of these larger areas of course coverage.

The most important and perhaps most difficult intellectual requirement of a student of medicine is the ability to integrate information into knowledge which can be put to present and later use. Self-education in this sphere of learning was thought necessary. But it is the teacher's responsibility to make this acquisition of knowledge on the part of the student less difficult to achieve.

Selectivity. The participants agreed that there should be no insistence that a student learn all of the factual information available in reference to specific courses in the curriculum, nor should efforts be spent on training the student to execute a wide variety of practical diagnostic procedures. Instead, it is the teacher's responsibility to select such methods as will serve as proper examples of ways and means of evaluating, through laboratory study, a clinical situation. For example, in microbiology the use of the blood culture can be made the subject not only of an essential diagnostic test, but also of a procedure illustrating principles of skin infection and sterility, and of interpretation. In clinical pathology one carefully selected test may serve to illustrate the purpose, methodology and reliability of a large number of tests which the student may need to know about but will not be required to perform. Since no teacher expects the undergraduate student to be a diagnostician in histopathology, the material furnished for study should be selected to help the student understand a disease process and not to develop a high degree of skill in recognizing specific lesions. These and other examples were cited in support of the contention that in the utilization of practical laboratory tests, just as in the teaching of facts, it is necessary to select for student performance only a few of the many tests available.

Need for periodic revision

A persistent emphasis on the need for continuous study of teaching objectives, and possible periodic revision, marked the discussion sessions at the Teaching Institute. Most conspicuous example at the Institute of a new subject which, many proponents urge, should be incorporated in the medical curriculum is genetics. To include it in an already overcrowded curriculum involves some revision—as does the continuous increase in scientific data. With no increase in available time, a constant accretion of subject

matter may be expected which necessitates recurrent reorientation of objectives. Ultimately, of course, the basic objectives of teaching are twofold: (a) to educate practitioners of medicine and replenish the pool of available physicians and (b) to produce also the teachers and investigators who will teach what is known and increase the sum of our knowledge. In reviewing the implementation of this dual purpose, it becomes necessary to review present trends in the light of past accomplishments and, if possible, anticipate future developments in the medical sciences. For this, much help may be drawn from the historical accounts of medical progress. New techniques and ways of teaching must also be recurrently examined in order to keep pace with changing objectives.

One participant summarized his own views in regard to the need for curriculum revision as follows: "We must assume that the curriculum will require changes, probably more and more frequently, in the future, and we will have to make some kind of allowance or planning for such changes. This should be a continuous process. I suggested to a group developing the curriculum for a new medical school that the dean should pre-empt one-third of all the time of each department as time on loan—really owned by the dean—and only loaned to the department for such period as seemed wise. This time could then be re-allocated without involving the problem of ownership of time, which now seems so prevalent in our schools."

II. Teaching in Specific Disciplines

General and Special Pathology

Course content

MEMBERS OF THE Subcommittee on Objectives of Teaching agreed in advance of the Institute that the term general pathology includes, for the purpose of course designation, the study of inflammation, circulatory disturbances, regressive changes, disturbances caused by living agents and principles of neoplasia. Special systemic pathology, as a course designation, implies the study of all disorders as may relate to a particular anatomic system. Together general and special pathology are usually designated as anatomic pathology.

Broad objectives

An analysis of the responses to the questionnaires indicated that, in the minds of the participants, the cardinal objectives of teaching of general and special pathology fell into one or the other of two major categories: (a) general objectives and (b) specific objectives. There appeared to emerge three closely related classes of general objectives: (1) to furnish the student with an understanding of the origin, course, sequences and results of disease states as indicated by the morphological and functional disturbances which arise; (2) to provide a means for the student to apply the knowledge he has obtained in the basic science courses to the clinical case problems studied in the clerkship years and thus prepare him for the practice of medicine, and (3) to acquaint the student with the capacity of living tissues to react (morphologically and functionally) to unfavorable environmental (internal and external) circumstances.

Among the specific objectives enumerated, the following were mentioned most frequently: (1) to strengthen students' ability to observe and reason; (2) to arouse a desire among students to read extensively and critically; (3) to cause students to think in precise terms and to strive for objective evidence for such conclusions as may be reached; (4) to increase students' medical vocabulary; (5) to induce students to understand and skilfully employ laboratory data in evaluating case problems; (6) to induce students to become interested in an investigative approach to medical studies and (7) to arouse an interest among some students in the specialty of pathology.

Primary significance of pathology. One participant summarized the views seemingly held by many. He pointed out that the primary purpose of a course in pathology in the medical curriculum is to initiate the student into the study of disease. Pathology serves as a bridge or link between the basic sciences or preclinical subjects and the courses in clinical medicine and surgery. For the student, the study of pathology provides an easy and logical means of relating the knowledge of normal structure and function he has already acquired to disturbances in structure and function he is to encounter in the study of patient material. Without a clear understanding of the etiology, the pathogenesis and the pathologic anatomy and pathophysiology of disease, clinical medicine would mean little more to the student than a memorization of clinical syndromes and empirical treatments applied to them. Anatomy, biochemistry, physiology, pharmacology and microbiology can be related, through pathology, to the study of clinical medicine.

Specific objectives in teaching general pathology

It was observed in relation to general pathology that an understanding of the fundamental disease processes referable to and affecting the body as a whole is essential. Equally important in the study of general pathology is the realization that the line of demarcation between normal and abnormal is not always distinct, and may be delineated only in respect to location and time. This being the case, it is necessary to develop in the student the habit of thinking in terms of: (a) causality, (b) interdependence, (c) compensation and (d) sequences.

It is necessary to assist the student to grasp securely certain principles of disease and to impart to him a realization that details may and do change without affecting the validity of principles. Furthermore, the student should be made aware of the limitation of our knowledge and understanding.

Specific objectives in teaching special pathology

There was agreement that in special pathology there is a need to provide the student with an understanding of the etiology, pathogenesis, pathologic anatomy and pathophysiology of disease and to relate these considerations to the clinical states as they are observed in living patients. Recognition of the paramount importance of tissue and organ reserve and of interdependence of organ systems is another objective. In the study of pathology, the student should be encouraged to develop habits of thinking which will enable him to recognize the disturbances caused by disease as relative phenomena dependent upon functional compensation and decompensation.

After considerable discussion, one of the conference groups summarized its views as to the specific aims of teaching general and special pathology as follows: (a) the sophomore course in pathology should guide the student in using and integrating all of the knowledge he has acquired previously so as to be able to apply this knowledge to the specific clinical problems resulting from disease entities, and (b) the course in pathology should bridge the gap between the first year preclinical sciences which are con-

cerned primarily with human biology in health, and the study of the much less certain and predictable phenomena of disordered states of man that result from disease. It was acknowledged that this transition is a difficult one for the student to make and, therefore, requires a great deal of assistance from teachers of pathology. The student is expected to master and take with him a considerable body of factual knowledge concerning disease processes. This factual knowledge should provide the student with a workable but not all-inclusive concept of disease, sufficient to provide him with a solid and well-organized concept of the functional disturbances that result from disease.

Functional aspects

Stressed throughout all of the discussion groups was the objective of preparing the pathology student for future clinical work. One danger pointed out was the error of teaching pathology as a purely descriptive science. Such an approach may endanger proper attention on the part of the student to the functional aspects of certain disorders where observable anatomic changes are minimal or nonexistent as, for example, the kidney in lipoid nephrosis. Pathologic anatomy must be used as a means of understanding disease, and not an end in itself. If this is done, it makes an excellent starting point to understanding the functional variations of disease.

Another possible danger inherent in teaching pathology as a descriptive science was outlined by one discussant in the following manner: "It seems to me that all departments should increase their emphasis on the functional aspects of disease. Pathology developed its dominant role in the medical sciences during the 19th century when it developed the tools that permitted it to substitute precise, well-defined concepts of various disease entities for the vague classifications of the earlier physicians. As a result, the great clinicians of the late 19th and even the early 20th centuries were the men who had the deepest understanding of pathology. However, if we look around today we can see that the greatest clinicians tend to be the men with the most profound understanding of normal and altered physiology. I can't help wondering whether the basic concept of disease, as a set of well-defined individual entities, may not now be outdated. This has been supported largely by the descriptive pathologist. It has served a purpose; but a more dynamic concept, more functional in orientation, is wiser and leads to more understanding of the exact nature of disease. Today we can make many quantitative measurements on human beings, and one can cite many so-called diseases—for example, Reynaud's disease—in which it is impossible to draw a sharp line between the normal and abnormal. If one takes a large number of people and measures the response of their blood vessels to low temperatures, there will be a continuous range of variation. The same is true of many physiological alterations. I, therefore, wonder whether the point of view of the old-fashioned physician who used to speak of a weak heart or weak lungs may not again find a place in medicine of the future. If this is true, then since it is still the province of the department of pathology to introduce the student to those basic concepts on

which he will build a picture of disease that will last him the rest of his life, it seems to me desirable that these departments emphasize functional alterations and quantitative measurements and point up the fact that pathologic anatomy is just a representation of function."

This comment singled out for quotation embodied a thought frequently expressed in the discussion groups. The conclusion emerged that careful attention should be given, when structuring any course in general and special pathology, to proper ways and means of emphasizing the functional aspects of pathology. Similar attention should be given to emphasizing the pathogenesis of disease and to providing an opportunity for quantitative evaluations of the degree to which function has been or is being disturbed in the disordered tissues and organs.

Variety of teaching methods recommended

Although the course programs, as used in some of the medical schools represented, were described in detail, no conference group attempted to prescribe an ideal course in general and special pathology. The view seemed to prevail that there is need for utilization of textbooks, selected reading assignments, lectures, group conferences and laboratory exercises. These teaching methods need to be properly oriented and balanced one against the other to provide the student with an adequate opportunity to acquire requisite knowledge of the structural and functional disturbances of cells, tissues, organs and organ systems as the result of the principal disturbances in external and internal environment which result from disease states. To achieve this, he should be encouraged to read systematically in one or several textbooks, and to examine selected articles and monographs. He should have the opportunity to listen to carefully planned and properly oriented lectures and discussions, to participate in discussion groups where his views and questions can be fully considered, and finally to perform meaningful work in the laboratory. (For a further discussion of teaching aids, see page 24).

In regard to the laboratory component of the course in special pathology, there was widespread opinion that the methods of instruction utilizing large numbers of prepared microscopic slides should be restudied with the aim of reducing the number of such fixed preparations. The advantages of substituting recently prepared exemplary material from cases studied or observed by the students themselves was emphasized. Fresh pathologic material should be used as much as possible instead of fixed museum specimens. Project teaching should, wherever possible, be introduced into the laboratory course, either as an individual student activity or as a group. An appropriate amount of autopsy material was listed as a valuable adjunct to teaching. It was suggested that the greatest value to be derived from autopsies is to provide the student with an opportunity to undertake a correlation of clinical and laboratory findings as observed during life with the pathologic findings in the tissues and organs at the time of death. Close integration should be developed in the teaching of general and special pathology with courses in clinical pathology and microbiology; and in-

struction in general and special pathology should be pursued in reference to case material during the clerkship years of the student's medical experience.

Clinical Pathology

In considering the overall objectives of teaching in the fields of pathology and microbiology, the Subcommittee on Objectives had become increasingly aware that clinical pathology represents a poorly defined area—both with respect to its relation to the undergraduate medical curriculum and its position as a specialty of teaching.

Definition

Prior to the Institute, on the basis of information furnished in response to the questionnaire, the members of the subcommittee attempted to frame a definition of the term clinical pathology as it relates to undergraduate studies. It soon became evident that it would be difficult or perhaps impossible to state a precise definition, and for this reason the following specification was suggested: clinical pathology may be regarded as the application of methods and instruments of precision to the solution of problems of medical diagnosis and to the evaluation of the consequences of disease.

The discussion during the Institute supported this as a reasonable interpretation of the term. But it became evident that the objectives of teaching in this field must receive thoughtful attention, and that an adequate and wholly meaningful course of instruction in clinical pathology may be difficult to achieve.

Frequently designated as laboratory medicine, laboratory diagnosis or clinical microscopy, this area is presently assigned to varying departments in different schools. The questionnaire disclosed that it is taught by the department of pathology in 15 schools; by departments of medicine and pathology in 10; by various combinations of departments of pathology, microbiology, medicine and biochemistry in 18; and by an autonomous department of clinical pathology in five medical schools.

Major objectives

On the basis of questionnaire and discussion, it seems to have been agreed that the cardinal objectives of undergraduate education in clinical pathology include furnishing the student with: (a) an appreciation of the intent and scope of the subject as outlined above; (b) an appreciation of the assistance he may expect in diagnosis, follow-up and evaluation of treatment from the application of any one or several of the methods of precision applied; (c) an appreciation of the interpretation of results of tests and correlation of these results with clinical situations; (d) a realization of the limitations of these methods; (e) an appreciation of the need for careful selection of the tests to be applied; (f) thorough familiarity with procedures which he himself can perform in the laboratory or office, to assist in the diagnosis and evaluation of his patients; (g) an understanding of

the principles upon which the technical methods and procedures are based; (h) an understanding of the importance of controls; (i) an understanding of the ranges of normal and abnormal values together with an appreciation of the principles of probability, and (j) an appreciation of the fact that diagnostic aids furnished by clinical pathology have been accumulating at an ever-increasing pace.

From the opinions expressed, it appears that the fundamental differences between pathologic anatomy and clinical pathology as undergraduate courses are fully understood. The applied character of the latter as an aid to clinical diagnosis was repeatedly emphasized.

Despite the obvious orientation of clinical pathology toward the application of laboratory tests and procedures to clinical diagnosis, it was noted repeatedly that the course in clinical pathology might provide an excellent method of instruction in the basic concepts of some classes of diseases—for example, disorders of the liver, kidney and blood-forming tissues.

Course content

Members of the subcommittee agreed that the subject matter included in clinical pathology should embrace hematology, clinical microbiology (including mycology and parasitology), clinical chemistry, and the general area of laboratory study best described as clinical microscopy. While there was no comprehensive attempt among the discussants to prescribe the content of an ideal course in clinical pathology, there was consensus that the student should acquire: (a) knowledge of practical diagnostic methods which he can and should use and (b) general familiarity with principles of more specialized tests which are performed in special laboratories.

In regard to the former, it seems to have been agreed that the student should become reasonably proficient in the performance of blood-cell counting and hemoglobin determination; in the analysis of urine, gastric and stool specimens; and in the performance of certain simple tests and laboratory procedures. He should be thoroughly familiar with the normal values applicable to all of these procedures.

The discussants generally concurred in the opinion that student instruction should be directed toward an understanding of the principles on which a particular procedure is based, and of the significance of the values obtained from its performance.

It was repeatedly emphasized that no attempt should be made to have students learn all or even any considerable number of the available laboratory tests currently employed. Instead, a few carefully chosen procedures should be used to serve as examples of ways of employing laboratory studies as aids in diagnosis and in the evaluation of the functional status of one or more of the organs or systems in patient material.

Place in the curriculum. Few of the conference groups undertook to state a specific set of objectives in teaching clinical pathology. Instead, some concerned themselves with a discussion of where and by whom clinical pathology might best be taught. There was considerable support of the contention that clinical pathology is not in itself a specialty. This was

disputed hotly by some discussants who deplored the attitude of those who, as they described it, would insist that "clinical pathology is a mirage and does not exist."

There was little enthusiasm for the idea of autonomous departments of clinical pathology in medical schools. Clinical pathology, the majority agreed, is an interdepartmental disciplinary problem, and the primary responsibility for instruction might properly be assigned to the department of medicine, pediatrics or pathology. Some pathologists expressed no interest in teaching clinical pathology. Others, while asserting that clinical pathology should be taught by pathologists, were not in favor of combining clinical pathology and pathologic anatomy. Nonpathologist participants thought that the techniques commonly known as clinical pathology could best be taught within the clinical departments during the clerkship years.

The markedly divergent opinions expressed in the discussions at the Institute can be grouped in four categories: (a) clinical pathology should be taught as an integral part of pathologic anatomy by the same instructors (it was contended that this method would make it possible to integrate pathologic anatomy with pathophysiology); (b) clinical pathology should be taught as a separate course in close juxtaposition to the course in pathologic anatomy; (c) clinical pathology should be offered as a separate course given by an autonomous department of clinical pathology and (d) clinical pathology should be included as a part of the teaching program of internal medicine, where it might be arranged as a companion piece to physical diagnosis.

Unique role of clinical pathology

It was evident that, in the minds of the participants at the Institute, clinical pathology stands apart in the sphere of undergraduate education. It is not a discipline comparable to microbiology, genetics or anatomic pathology. It represents a course of study in the application of methods and instruments of precision to the solution of problems of medical diagnosis and to the evaluation of the consequences of disease.

The need for a clear set of teaching aims in clinical pathology emerged from the discussion. Furthermore, once a proper set of objectives has been established, it was generally agreed that all preclinical and clinical departments should share responsibility for instruction in this area. Under such an arrangement the formal course in clinical pathology need not be long and involved. It was thought that this could be organized successfully under any one of a number of departments in a medical school. However, it was important that responsibility for it devolve upon one department.

Microbiology

Objectives

Discussion of the objectives of teaching in microbiology disclosed a dichotomy of opinion as to whether this discipline should be taught as a science or in strict reference to its clinical application.

Most of the participants felt that neither method was proper and that a middle-ground position with respect to course orientation was best suited to the needs of the total student body.

Some discussants, however, believed that the primary aim in teaching microbiology was to provide students with concepts and techniques directly applicable to medical practice. To meet these objectives the course should emphasize techniques in practical laboratory diagnosis and bacterial identification. As an extreme example of this point of view, one representative expressed the opinion that the study of microbiology should provide adequate training for medical practice requirements but not for research; and that the course should be designed to fit the physician's current needs, which are conspicuously less than they were formerly.

The majority disagreed with this contention. On the contrary, they said, the performance of practical diagnostic techniques should be minimized. Microbiology should be taught as the study of the biology of infections and of the interaction of two biological systems, host and parasite.

Scope

The discussants at the Institute were reminded that the term "microbiology" is misleading. As one microbiologist pointed out, "It is not microbiology but microbe-biology that is meant. This discipline comprehends the properties of microbes as free-living forms and in their relation to the host, whether or not they cause disease." It does not, as one might expect, refer to the biology of all small things, including the individual cells of multicellular animals such as man. It involves a large measure of ecology, being concerned with the mode of life of an organism and its relation to its environment.

The scope of any discipline, it was observed, depends to a large extent upon the training and interests of the persons who practice it. In this regard one microbiologist commented dryly that pathology, for instance, can be as much as one wants to make of it. "With the word meaning 'the study of disease,'" he noted, "all that remains to the other disciplines is the physical examination of the normal human, a little preventive medicine, and running the dean's office." Microbiology, he stressed, is a part neither of pathology nor biochemistry with which it shares some techniques. It has its own subject matter and is a part of the larger realm of biology.

Attention was called to the fact that microbiology grew up as bacteriology within departments of pathology because that was where the microscopes were, and the people interested in using them to study disease. Several participants underscored the importance to medicine in general of the separation of microbiology from pathology, "which has been so concerned with the morphology of the end results of disease." At this point several pathologists intervened with lively disagreement.

It was noted that at present the only part of microbiology commonly left with the pathologists is the service function—the running of the clinical laboratories in microbiology which are generally under the direction of a pathologist, in the name of clinical pathology. Considerable gratitude

was expressed by one microbiologist to his pathologist colleagues for their willingness—even eagerness—to shoulder the service functions of microbiology. Said he: "This attitude has permitted microbiologists to proceed with original investigations that have been of enormous benefit to mankind during recent years." (The burden of the service functions that have been assumed by pathologists is discussed elsewhere in this report. See page 67).

Essential subject matter

The subject matter of medical microbiology was summarized as including the biological properties of bacteria, viruses, rickettsiae, fungi and protozoa especially as they relate to disease. It is deeply concerned with pathogenesis. In connection with the properties and interaction of host and parasite, factors of host resistance come in for major attention. Immunology demands increasing emphasis each year. With the advent of successful antibacterial chemotherapy and the decrease in a large segment of acute infections, the role of the immediate and delayed types of hypersensitivity has become steadily more apparent. Immunology is also essential to an understanding of the specific prophylaxis of infectious diseases.

Several of the microbiologists at the Institute stressed the importance of a genetic approach to such problems as virulence, resistance to chemotherapeutic agents, appearance of new viral strains and an understanding of blood groups and the diseases associated with them.

Chemotherapy, it was pointed out, is also an essential part of microbiology. It is therefore appropriate in preclinical years for this specialty to teach the antimicrobial action of drugs both *in vitro* and *in vivo*, leaving to pharmacology and pathology the discussion of absorption, metabolism, excretion and toxicity of the agents. It was noted, however, that with respect to toxicity, those manifestations associated with the hypersensitive states should be handled in microbiology.

The need was stressed for closer integration of microbiology with other courses, particularly pathology, preventive medicine, medicine and pediatrics. To achieve this, more teaching time for microbiology in the later years of medical studies was recommended.

It is important that the student acquire an adequate understanding of the dynamics of infectious disease in the living patient. This was underscored as one of the major, if inadequately executed, functions of the teaching of microbiology. To illustrate the importance of clinical teaching in microbiology, a parallel was drawn between the discovery many years ago that placing an obstetrical patient in a bed next to a patient with scarlet fever was dangerous, and the recently acquired realization that exposure of uninfected patients to patients with penicillin-resistant streptococcus infections in hospital wards is hazardous.

Microbiologists: Ph.D's versus M.D.'s

Departments of microbiology in medical colleges tend to be staffed by those with Ph. D.'s rather than M. D.'s. It was thought important under

such circumstances to have a senior department member with clinical training who could act as liaison with clinical medicine and keep the teaching of microbiology in line with the needs of medicine.

Because of the vast amount of general biology that must go into the background of a well-trained microbiologist, the discussants with varying degrees of acceptance admitted the inevitability of drawing from the non-medical biological sciences for staff. One participant forcefully pointed out that it was the responsibility of medical schools to attract more men from the biological sciences, possibly through grants and fellowships. But recruitment of fully trained medical microbiologists should be encouraged by every possible means. The difficulties would continue to be great. As one microbiologist commented, "Having to study medicine, in addition to all the other things required of him by the microbiologists for academic training, is a burden which a teacher finds almost impossible to equate with his financial resources as well as his life span." (For further discussion of recruitment problems, see page 70)

Genetics

The pertinence of genetics to modern medical education, and suggestions as to how this subject might be added to the medical curriculum, was the subject of a panel meeting early in the Institute. Its influence was to be felt throughout the ensuing discussions.

In the words of the chairman of the genetics panel: "The relationships of pathology and microbiology being what they are, representatives of these two disciplines have no problem in establishing a common meeting ground at the Institute. But neither of them has seen much of that 'Johnny-come-lately,' genetics. This is the reason for a special meeting: to delineate some of the areas of common interest, and lay a basis for profitable discussion in the week to come."

That this was accomplished successfully there was little doubt. In fact, as one of the geneticists commented after the conference was over: "The Teaching Institute turned out to be something of a surprise to those of us invited to represent medical genetics as a scientific discipline. Genetics is certainly the 'little brother' of the group, and most geneticists expected to be called upon to justify their very existence. Instead we were welcomed to the fold. This attitude has been especially gratifying to those who have expended the major part of their academic efforts in applying genetics to medical problems."

Current status in medical schools

The participants at the Teaching Institute were reminded that genetics is a young science, even younger than radiology. The development of human

or medical genetics for a while lagged behind animal and plant genetics, and bacterial genetics is an even more recent development. Most of the genetic knowledge applicable to man and medical problems has developed within the past 25 years, with its most rapid growth within the past 10 years. Some formal teaching of genetics was introduced into the curricula of certain medical schools about 15 years ago. Since then the idea that schools have a responsibility in providing some instruction in the science of genetics has gradually spread. The amount given, however, is minimal and its scheduling spotty, judging from questionnaire replies and information culled from the discussion. Only here and there are some schools pioneering in developing what the geneticists at the Institute described as adequate programs.

According to the results of a questionnaire in 1953, 55 per cent of the medical schools in Canada and the U. S. gave some instruction in genetics. Only six actually offered a course in genetics, consisting of from six to 24 class hours. Several schools present basic genetic principles in a block of lectures injected into some other existing course such as anatomy, histology, embryology, pathology, microbiology or biochemistry. These occupy from two to 12 class hours. A few schedule two or three lectures on genetics in certain of the clinical departments, chiefly preventive medicine, obstetrics or psychiatry.

Value of genetics in medical practice

One of the proponents of genetics concisely described for the Institute some of the reasons why genetics was essential to the basic training of the medical student: "The most fundamental answer may be that an understanding of genetics will contribute to the physician's basic understanding of the etiology of disease. Genetics provides the scientific basis for the concepts of individuality and variation within the species, and hence for certain differences in susceptibility to disease and for some types of hyperreaction. An understanding of genetics contributes much to an understanding of the complex interactions that exist between man and his environment.

"Pathologic genes arising by mutation are themselves etiologic agents of disease. The number of specific disease entities that are primarily due to a single gene mutation must be reckoned in the hundreds. These include many congenital malformations, most of the metabolic diseases, and many of the so-called degenerative phenomena. With the increasing control of infectious diseases and the reduction in mortality of infants and children, diseases of genetic etiology account for an increasing proportion of medical practice. This large group of diseases will be much better understood by physicians who are familiar with a few principles governing single gene transmission and action.

"The truly basic biologic nature of the laws of genetics is demonstrated by the fact that many of the principles applicable to man are also applicable to micro-organisms. Experimental demonstrations of genetically controlled variations in host susceptibility and in virulence of the invading

organisms have often been performed, as in mouse typhoid. Similar variations under genetic control apparently exist with respect to a number of human infections, including tuberculosis and poliomyelitis. The phenomenon of mutation in bacteria is comparable in all respects with mutations occurring in multicellular organisms, including man. The study of bacterial mutations and population dynamics has provided vitally useful information in connection with the use of antibiotic drugs. Other intriguing recent developments include the phenomenon of transduction, involving the transfer of genes from one strain of bacteria to a second strain by the mediation of a bacteriophage.

"These are merely some examples of the broad usefulness and applicability of genetics knowledge to medical practice. Diseases in which hereditary factors are important are encountered in any specialty. For example, an obstetrician must know something about the genetics of the Rh factor and other blood antigens to handle properly cases involving serologic incompatibilities between mother and fetus; and he must also be conversant with all causes of congenital malformations.

"In clinical practice genetics also serves as a useful tool in prevention of disease and limitation of disability. In an increasing number of conditions it has been shown that the development of clinically overt disease depends on the existence of two sets of factors: (a) a specific genotype or genetic constitution conditioning susceptibility of the host and (b) some combination of specific environmental insults. Advances in genetic knowledge are providing methods of identifying 'high-risk' individuals for a number of clinical situations. In about 35 conditions a 'carrier state' may now be identified by the use of laboratory or other methods to detect the presence of a potentially dangerous mutant gene in apparently healthy individuals. Reliable empiric risk figures for the development of certain abnormalities in the sibs or children of affected persons are now available for many conditions. Where high-risk individuals may be identified by family history or by laboratory study, attention may then be directed toward modification or control of the precipitation environmental factors in an effort to prevent or modify the development of disease. This approach represents a field of preventive medicine that has only recently been opened, and which can be most effectively utilized by the clinician, particularly the general practitioner."

The teachers at the Institute were in accord that genetics on the basis of these and other considerations had earned a place in the medical curriculum. The question was, how could the injection of this new subject matter into an already overcrowded curriculum be accomplished? What should be taught, by whom, when and how?

The speculation of conference groups on these questions highlighted the difficulties involved in all efforts to modify a curriculum. The geneticists present gave to the discussion an essential frame of reference. They described how programs had been structured by several pioneering schools, and pointed the way toward similar ventures for faculties interested.

Essential subject matter

The question of what to teach in genetics, it was observed, is directly related to objectives. Since the aim is not to train specialists in genetics, there is no need for a comprehensive course in this subject area. What is sought is to acquaint the student with basic principles, thus giving him the tools required for later work and a framework which may later be filled in with clinical details. A geneticist proposed these fundamentals as basis for consideration:

1. Some knowledge of the physical basis for heredity. The student should understand the mechanism of chromosomes in cell division and the genetic implications of meiosis. He need not concern himself with details of cytology.

2. An understanding of the basic single gene mechanisms that give rise to the classic type of pedigrees, namely; the simple dominant, simple recessive and sex-linked types, and the purely relative nature of the concept of dominance.

3. An understanding of the concept of interaction between heredity and environment, and the concept of penetrance and the carrier states. The usefulness of twin studies as a tool in identifying genetic and environmental components in the etiology of many conditions might be discussed.

4. An understanding of mutation and its evolutionary significance, with particular reference to the experimental production of mutations by ionizing radiations. The student should be made aware of the possible mutational hazards of the roentgen ray and atomic energy.

5. Introduction to the idea of gene frequencies and the simple concepts of population genetics, with regard to both human and bacterial populations.

6. Instruction in practical problems of genetic counseling and in the medico-legal applications of blood-grouping.

Consensus of the geneticists present was that these principles could be covered adequately in 12-14 lecture hours, if supplemented by a moderate amount of reading in available texts.

Introduction into the curriculum. Some faculty members expressed the opinion early in the discussion that basic principles of genetics should be acquired in the premedical years. It was suggested that perhaps the schools of medicine should require college courses in genetics before admission. The majority felt that this would not be desirable in view of the general policy of recommending a well-rounded premedical education without undue emphasis on special branches of science. As one teacher pointed out, medical schools usually require only one year of biological preparation. It would be difficult to take a period of time out of this for adequate training in genetics. Furthermore, college courses in general genetics cover so many different aspects that peculiarly human problems come in for minor treatment. "The responsibility of teaching genetics devolves on the medical schools. We cannot shirk it by 'passing the buck' to the arts colleges."

Most discussants agreed that the basic principles of genetics should be

taught somewhere in the preclinical years, either as a separate course or as a block of lectures within some established course. Discussions of how this might be structured led into the matter of interrelationships and integrated teaching. Sharp emphasis was placed on the importance of correlating genetics with the appropriate disciplines. All geneticists present underscored the fact that only in this way could it be meaningfully taught.

Some felt that genetics correlated best with embryology or anatomy because of its importance in connection with normal development and malformations and the concept of individuality. Others thought that the considerations of etiology and applications to microbiology dictated its correlation with pathology or microbiology.

The value of integrated genetics teaching in the clinical years was also stressed. One geneticist called attention to the fact that genetics lectures were assigned to a variety of clinical departments in several schools. It would have been preferable to have had the basic principles instilled in the student earlier so that the clinical time allotted could have been spent in applying genetics knowledge to specific problems. Under present circumstances there is insufficient integration of genetics with course content. Also, he pointed out, "Although various schools are introducing genetics at scattered points in their curricula, somewhere along the line we should have some point at which all of these principles can be pulled together. A lecture or two spotted here and there will only develop a sense of inadequacy in a student with regard to this science." The analysis of the student questionnaire completed prior to the Institute seemed to support this point of view.

Functions of a staff geneticist

Ideally, it was conceded, it would be desirable to have a trained medical geneticist on the staff of each medical school. He might be either an M.D. with special training in genetics, or a Ph.D. in human genetics with added training in the special applications of his subject to medical problems. Such a person could be attached to any department in accord with administrative convenience. He could function in several ways: he might teach the course or give the lectures on general principles in the second year. He could be used for integrated teaching in many areas, as for example in the problems of maternal-fetal immunologic incompatibilities, in connection with the teaching of metabolic diseases, anemias, bone and eye diseases and in other areas.

Combine genetics and biostatistics. Considerable interest was expressed in the proposal that a staff geneticist might also be responsible for teaching biostatistics, as any well-trained geneticist must have a working knowledge of this field. In this regard the suggestion was developed that the concept of a twin department of genetics and biostatistics might facilitate the introduction of both these disciplines into schools where they are nonexistent.

Service and research. A staff geneticist should also have service and re-

search functions. He should be available for family counseling with patients needing advice on personal problems regarding heredity and with practitioners requiring specialist help on complex genetic problems. The value of an heredity clinic providing such counseling services, and functioning as a research center, it was noted, was evidenced at the University of Michigan.

Teaching techniques. The question was raised whether it was advisable to restrict a student's introduction to genetics to formal lectures. Some geneticists were of the opinion that laboratory work might be overly time-consuming. They pointed out that the lectures given need not be didactic and could include presentation of case histories and photographs or specimens. Others thought that some laboratory work could easily be incorporated in such a course. In the words of one: "An important part of the teaching of genetics consists of problem-solving. Analysis of pedigrees and the determination of simple probabilities relating to genetic prediction and counseling will take the place of laboratory exercises in other disciplines. There are simple tests such as blood-grouping and reaction to PTC which could be included, which would illustrate principles and make the subject more vivid than mere lectures."

Another discussant commented: "Genetics is one of the most analytical sciences in biology and lends itself beautifully to exercises in which the well-established principles can be applied by the student. Also, if genetics is taught simultaneously with microbiology, certain of the exercises in microbial genetics can be considered exercises in the genetics course at the same time."

Recruitment. The representatives at the Institute realistically faced the fact that there are not enough trained geneticists available to staff even half the number of schools lacking them. It was felt that if curriculum time became available and it became known that such positions exist, men with interest in this field would be encouraged to seek professional careers in it. Some years, however, would be required to fill the ranks from this source. Several temporary expedients were discussed. Fellowships that would permit qualified teachers to spend a year in study at a chosen institution would be helpful. The suggestion that aroused most interest was a proposal to set up workshops for teacher training at some school already doing work in this field. Evidence of the success of such "cram" courses in other fields was cited—specifically, that conducted in recent years at Oak Ridge, Tenn. Here a month-long summer workshop gave instruction relating to the introduction of isotopes into experimental work. The training period thought necessary for adequate preparation to teach genetics under such a stepped-up program varied from three to six months. The idea of a three-month summer course appealed to the majority as being adequate as well as most feasible.

It was thought likely that candidates for such a workshop might be found on every faculty in the person of a teacher who already had some interest in the problems of heredity in medicine and who would like to

know more about it. The workshop would offer an intensive course in principles and methods in genetics, and make available the latest information for those particularly competent in special areas. No one school would be expected to supply all of the personnel needed to conduct such a workshop. These might be recruited through the cooperation of several different institutions, perhaps with the assistance of the American Society of Human Genetics. The financing of such a program might be undertaken by an interested foundation in cooperation with the medical schools.

A workshop of this sort, it was recognized, would not turn out finished professional geneticists; but it would provide the means to implement a modest genetics program without requiring an increase in staff.

In conclusion, the point was made that no matter how many hours in genetics might be added to the curriculum, a "lasting genetic awareness" would not be achieved unless the clinical faculty is alerted to the possibilities of genetics. Their influence on the students would be of critical importance in determining the degree of interest manifested in this subject, and its eventual stature in the curriculum.

III. Teaching Procedures

THE RELATIVE MERITS of various teaching methods, ranging from the traditional medical lecture to the increasingly popular group conference, were discussed at the Institute. Although few conclusions proved acceptable to all participants, it was generally agreed that lectures, laboratory exercises and group conferences all have a proper place in the teaching programs in pathology, microbiology, immunology and genetics. The relative value of these different procedures is dependent, in large measure, on the skill with which each method is employed and executed. Class size, number and quality of available teaching personnel, physical facilities and other practical considerations must be taken into account in determining the proper methods of instruction in each department and in each institution.

The lecture

Despite comments to the effect that "the lecture became obsolescent with the invention of the printing press," "the lecture method is the lazy man's method of teaching," and "the lecture is a necessary evil," it was generally agreed that lectures if properly used have great value and should continue to hold their established position as an important teaching method. Some of the more cogent reasons in support of lectures were: (a) through lectures students become acquainted with senior members of the faculty and can profit from their personal experiences, methods of evaluation, accomplishments and attitudes; (b) lectures provide a means of explaining and classifying essential material derived from study of textbooks and other assigned reading and from laboratory experience; (c) they provide all students with a core of required knowledge and (d) if properly given, will stimulate student interest in reading and participating actively in the search for new knowledge through an experimental approach. The lecture method furthermore provides an excellent training ground for the young teacher since he is required to assemble, classify and evaluate his material for presentation and, in so doing, relate it to the total course structure. The success of the lecture will always be related in large measure to the skill, ability, devotion and enthusiasm of the lecturer.

Group conferences

In considering the role of the group conference in teaching, a wide variation was apparent in the manner and extent to which conferences are currently used. In the main they appear to be employed for the

PLATE 3. "Doodles" were frequently found on conference tables at the conclusion of discussion sessions. A few are reproduced above.

purpose of: (a) day-by-day coverage of course material, either to replace or supplement the lectures; (b) extending the students' study of reading materials beyond that included in textbook sources; (c) explaining the content and purpose of the laboratory assignments; (d) providing a method of periodic oral quizzing and (e) providing a method of group consideration of case material (autopsy conference) or of particular topics and techniques.

Representatives from a number of the medical schools described in some detail the methods employed at their institutions, either on an experimental basis or as an established procedure. One method makes the laboratory the center of the teaching program. Thus, in preparation for the laboratory exercises informal group discussions are employed to explain the purposes of the assignments and evaluate the results of the students' work. In this institution such conferences take the place of conventional lectures. In another the class in pathology is divided into two parts; one is taught with conventional lectures and laboratory exercises; the other receives no formal lectures and is dependent upon reading assignments, conferences and closely supervised laboratory work. It was thought that evaluation of the results of these two methods would prove helpful in future planning of course structure.

Group conferences centering around autopsy cases and designed to correlate the clinical and laboratory findings with the pathologic changes were thought a valuable exercise and one that should not be neglected. It was acknowledged that group conferences, to be successful, generally require a great deal of preparation on the part of faculty members conducting them. They also require the active participation of the students. In addition a successful conference program requires a favorable ratio between skilled and experienced teachers and the student body. The opinion was expressed that some departments would need to add two or three times the existing complement of teachers in order to carry on a successful conference program.

The employment of group conferences in the teaching of the subjects of the Institute was acknowledged as desirable if not actually essential to a successful program. Just as in the case of lectures, the success of the conference method will depend to a large extent upon the skills and abilities of the conference leaders and the expertness with which the conference exercises are blended into the total course structures. The obvious advantage to be derived from group conferences in promoting integration of subject material taught by different departments was emphasized, and it was agreed that interdepartmental conference programs should be employed in selected areas of instruction. (For further discussion of group conferences, see page 42)

Laboratory exercises

It soon became evident when instruction by laboratory methods came under discussion that the term "laboratory exercises" meant different things to different participants. To some the term seemed to imply the

performance by all students of a number of stereotyped procedures specified in manuals passed on from one class to another. For example, in anatomic pathology the laboratory work might consist of the systematic study of large numbers of prepared microscopic sections, with or without accompanying mounted gross organ specimens. To others laboratory exercises indicated an experimental approach to the study of lesions or diseases through controlled experiments conducted by the student. Since the concepts of laboratory work were so varied, it is not surprising that few conclusions were reached in regard to the amount of time required for laboratory instruction or the proper design of the laboratory component of any given course. Individual opinion varied from "the more laboratory work the better" to "enslavement to any one teaching technique, especially the old so-called classical laboratory method, has come near to destroying the usefulness of pathology in the curriculum."

Some pathologists regarded the laboratory as centering around the autopsy, with emphasis on correlating the clinical with the autopsy. In this connection strong stands were taken on opposing points of view. Some participants decried the use of what they termed "static morphological material" and urged the use of animal experiments to demonstrate disease. Others with differing perspectives on laboratory exercises insisted that a dynamic concept of disease could be obtained through using both the autopsy and animal experimentation. It was thought important that the teacher not be committed slavishly to any one method—whether it be didactic lecture, animal experimentation, or autopsy and clinical correlation. Many felt that all of these have much to contribute in giving the student a living concept of disease; but unless the teacher is always on the alert, any method, whether morphological or functional, may become static and a waste of time.

The one conclusion concerning the purpose of laboratory work about which there seemed to be agreement was that it should not be used merely to teach techniques and to observe the phenomena of disease. It should also be used to impart a scientific attitude to the student. There was general belief that the utilization of controlled experiments in the analysis of observations or of hypotheses is the best way to induce a student to acquire an appreciation of the scientific method. He should learn, for example, to ask questions, to translate the questions into a method of inquiry, and to obtain and evaluate an answer.

A representative of one school reported that at least 25 per cent of the laboratory time in the course of pathology is devoted to experiments. Another participant reminded his colleagues that poorly conceived and executed laboratory exercises can be as didactic as any textbook method of instruction. Many microbiologists in the group were of the opinion that repetitive laboratory work should be decreased as much as possible, so that more time might be spent on the clinical phases that induced higher motivation.

With regard to teaching microbiology, the suggestion was made that the use of enrichment culture technique, with the isolation of organisms

from the student himself or his immediate environment, offered an interesting departure from the stock cultures usually distributed.

The case method

Both pathologists and microbiologists at the Institute considered the case method as valuable in increasing student interest. They stressed the advantages of introducing patients and clinical problems into laboratory exercises. A word of caution was expressed in that the students' accomplishments via this method in the sophomore year might not be as great as the enthusiasm of the teachers for the method.

Some institutions that had used gross or preserved fresh material as a teaching procedure in connection with case histories had abandoned it for varying reasons such as: the students were too interested in the immediate findings and not sufficiently concerned with general principles illustrated, and the sessions were too formal. Several schools utilize the attendance of students at autopsies in which complete participation and reporting are required. Some schools teach students on the autopsy service full-time as a clinical clerkship.

Autopsies

It was general opinion that the autopsy is the basic teaching instrument in pathology and should take precedence over regular course work. A de-emphasis on use of slides in histopathology was recommended by some participants, although the technique was effective in teaching observation and building an understanding of disease processes.

Project teaching

The discussion of the role of the laboratory in teaching the subjects covered by the Institute led many of the conference groups to consider "project teaching." As with laboratory exercises, there was variance of opinion as to what exactly was "project teaching." Some wished to reserve this term for a student enterprise in which the student, either on his own or with a group, takes part in a specific investigation in which an effort is made to extend the field of science. Some discussants cautioned against confusing genuine research with the laboratory exercise in which well-known facts are demonstrated on animals. Other participants, however, thought that the mere use of animals in an experiment makes it a project, and wished to call any exercise using animals "project teaching." Another point of view as to what constitutes project teaching was expressed by those who considered it the pursuit of knowledge around a central theme—whether based on library research, a clinical case studied in the autopsy, clinical record or various types of animal experiments.

A discussion of dangers, drawbacks and difficulties in implementing a program of project teaching did not dampen the enthusiastic consensus that the method, if properly used, has much to offer as a learning experience. Among the hazards alluded to, the following received most comment: the introduction of stereotyped or "canned" research problems

into the student's work tends to impart to him a false concept concerning the requirements for imagination and thoughtful planning in defining the problem. Also, through participation in stereotyped research problems the student may fail to gain insight into the requirement of the proper evaluation of the results, and in addition he may tend to relate himself to the role of a technician. Chief difficulty is that at present many medical schools do not have adequate staff, facilities or funds to conduct project teaching in a realistic manner.

Many persuasive arguments were voiced in favor of project teaching. In the words of one of the more articulate discussants: "Project teaching, in some areas of medical education, may help to throw us forward—(as suggested by the meaning of the verb 'project'); or at the very least, help us break the shackles that have bound us to somewhat sterile traditional methods of exciting the interest and curiosity of students."

As an educational technique it drew praise from many teachers who thought it aptly designed to stress the dynamic aspects of a phenomenon.

One member of the Institute spoke for many in pleading for emphasis on the dynamic rather than the static nature of pathological processes and the need for further application of the experimental methods. "If pathology is looked upon as a dead subject, it is the pathologists who have made it so. A neoplasm has never arisen in a corpse; an abscess has never developed in a dead body. Diseases occur only in the living, and they are not static states on a microscopic slide or in a museum jar. They are dynamic events and the functional disturbances caused by them are as much a part of pathology as are the morphological changes that produced them.

"Unless the young doctor can learn to view the autopsy, gross specimens and microscopic slides as a single frame removed from a moving picture film, upon the basis of which he is to construct the entire plot and the roles of the various actors, even morphology has failed to serve him. If he cannot read still further into the picture and interpret the effects of the altered morphology upon the functions of the host, then pathology has failed to equip him with what he needs from that science. If the student is given opportunity to watch things as they occur, he cannot escape realization of the morphological and functional flexibility that constitutes a disease process."

Project teaching, he felt, was well adapted to bring out these concepts. In pathology experiments on inflammation, chematasis, sensitization phenomena, wound healing, effects of irradiation and carcinogenesis can be readily devised for performance by individual students or groups. Similarly in microbiology a wide range of projects can be designed for a student in which he can participate in planning and execution as well as in evaluation. While carrying out the project, the student will acquire the techniques he otherwise would have learned through a more didactic course of instruction.

Project teaching, in addition to cultivating a scientific attitude, is particularly stimulating for students with potentialities for future experi-

mental work. As one teacher said, "Those who develop unusual interest in this work, perhaps favoring it as a career, can be drawn into our own laboratories, where we can pamper them to our hearts' content—for herein lies the hope for the future of our science."

To be successful, project teaching should be so designed that the student will play a dominant role in selecting, designing, executing and evaluating the experiment which he is to perform or on which he is to collaborate. The purpose of the experiment should be clear in the mind of the student, and adequate consultation should be made available to him to assure that his labors are not misdirected. In addition, a method should be provided whereby the experimental results can be properly recorded, analyzed and evaluated.

Textbooks

The function of textbooks provoked considerable discussion. The question was raised as to whether they were merely catalogs (shelves of facts to be drawn from), whether they should teach, whether they should inspire, or whether they should induce a system of thought in the student. No conclusions were reached. Available textbooks were regarded as "fairly adequate," although the quality of those in clinical pathology was questioned. The lack of general agreement as to textbooks preferred by the participants was regarded as healthy. It was thought advisable to give students leeway in selecting their own source material from a recommended list, although a few participants felt that the teacher should recommend a specific text since students cannot be expected to judge their relative worth at the time they purchase them.

In one group discussion centered on the use of laboratory manuals. These were considered necessary in microbiology. There was some difference of opinion as to their worth in pathology. As one faculty member commented, "They seem to be expected to compensate for the shortage of teachers in pathology."

Outside reading. The consensus was that students should be encouraged to do collateral reading. Frequently they are impeded from doing so by an overload of material presented in lectures, conferences and laboratory. Teachers expressed the opinion that the better students have a real interest in current medical literature. Suggested rather than required outside reading assignments were recommended in preclinical years. Note was made that the medical library facilities in some schools are inadequate for extensive reading of periodicals. Some teachers belittled the helpfulness of such reading as early as the second year.

Audiovisual aids

New ways of teaching opened up by the increased availability of audiovisual aids excited the imagination of some of the teachers at the Institute. Television, for instance, could bring to a student the entire technical details of an operation. He could see the morbid anatomy encountered, could view the preparation of a frozen section, could see the microscopic

projection of the frozen section and listen to a discussion of the problem by the surgeon and the surgical pathologist. The lack of personal participation in such learning experiences was considered by some as a factor deterring over-reliance on this technique.

Examinations

Examinations have a multiple purpose. In the words of one group, they can serve as means for student evaluation, a guide to teaching effectiveness, an assessment of teaching techniques, a means of emphasizing essential subject matter, a goad to deficient students and a measure of student problems.

Basic to the effective use of examinations, one discussant pointed out, are certain principles. "We must first know what we wish to measure; we must design the examination properly to procure all necessary information; and we must evaluate not only the results but the validity of the questions themselves in the light of actual use."

The value of examinations as an important learning exercise was generally accepted. They force a student to correlate in his own mind the different facets of his education. As one member commented, they encourage what Cardinal Newman 100 years ago called "mental digestion."

The importance of examinations in affording an experience of stress for a student was underscored by several faculty members. Particularly in the field of medicine, crises are inevitable. The ability to think and act effectively at such times, they pointed out, is one that must be cultivated by all would-be doctors.

A common criticism of examinations is that they emphasize grades unduly. Many participants at the Teaching Institute were of the opinion that a simple grading method of pass, fail and honors should be used. They felt that the traditional numerical grading system employed in many schools should be abandoned. One discussant recommended that grades be withheld from both student and unconcerned departments. He represented a large contingent who felt that student anxiety toward the examination experience should be alleviated. The extreme point of view was expressed by several participants who felt that examinations were disadvantageous rather than helpful, and as such should be dispensed with entirely. In their own schools, they disclosed, courses were conducted effectively without using any sort of written examinations. Daily independent student appraisal by individual faculty members sufficed. Some stated that they would like to dispense with examinations but could not because of administrative requirements with respect to grades. It was indisputable that grades frequently are used as chief basis for appointments to internships and other desirable posts.

Consensus was that a variety of examining techniques were to be recommended, including the oral examination, the objective and the essay examination. A proper balance of these would afford a better picture of the wholeness of a student's knowledge than any single test. "We need them all." Very frequent testing was not advocated.

Essential considerations in giving examinations were that they should be graded by a responsible department member and returned promptly to the students to be discussed with them. (For more on examinations, see page 41)

Evaluative techniques recommended. One member of the Institute called attention to a wider problem posed by consideration of examinations. There are many things to be measured in whole or in part by examinations, but relatively few techniques exist to satisfy diverse needs. Some profitable investigation might be devoted to this field.

For example, he pointed out, in medicine there is frequently need to evaluate a man's comprehension of practical laboratory or clinical work. Can an examination be prepared which will test a student's ability to handle laboratory problems or properly study a patient on the ward?

Tests being developed by the Educational Testing Service at Princeton, N. J. were described as showing promise of partly solving this problem. In this new procedure the student is given a summary of the patient's clinical history and physical examination, as well as an index file containing cards with the answers to laboratory findings. The student decides which laboratory tests to use, pulls the appropriate card from the file and places it on a spindle. He proceeds to do this until he has worked up the case to his satisfaction and arrived at a diagnosis. He is graded not only on the diagnosis but also on which tests were selected and the order in which they were used, thus arriving at an estimate of his skill in practical application.

A need for better testing techniques in many areas was expressed at recurrent times in many discussion groups. Teachers appeared to be groping toward up-to-date methods of more effective appraisal of applicants to medical schools, of students, of teachers and teaching procedures and finally, of the finished products of medical education—practicing physicians.

Many new methods of evaluation have been devised to meet the need of personnel and vocational aptitude assessment in diverse fields. Many strides, too, have been made in educational testing, and the results are being effectively applied by alert institutions. With this in mind, it was proposed that a study be made of such testing techniques as are available that are pertinent to medical education. This survey should then be made available to the faculty of the medical schools. A discussion of the relative merits of such testing techniques, based on experience, might eventually afford sufficient material for a fruitful session of some future conference.

One faculty member thought this the most exciting idea that came out of the Teaching Institute, and one which, if implemented, would do much to bring medical teaching abreast of the times. (For more on testing, see page 65)

IV. Interrelationships of Pathology, Microbiology and Genetics

IT WAS WITH considerable interest and curiosity that the staff of the 1954 Teaching Institute placed the provocative topic of interrelationships on the agenda.

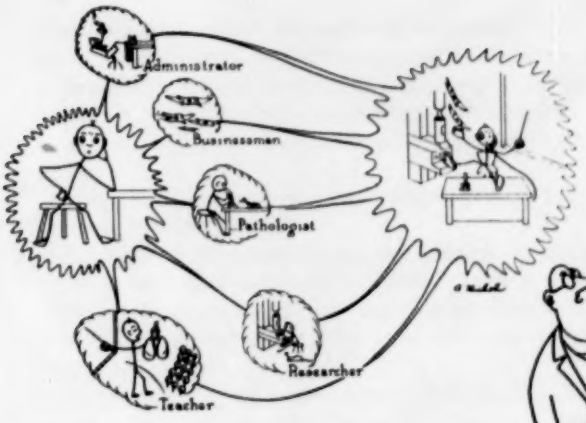
It became obvious as discussions developed that extreme confusion exists in this area because of semantics. The terms correlation and integration implied different things to different participants. There were few common concepts and interpretations of meaning. Before launching into profitable assessments of their usefulness as teaching methods, the discussion groups therefore found themselves grappling with the problem of more precise definition. In this some were more successful than others, in part due to the presence in these sessions of delegates from schools that had put some degree of correlation into practice. Their actual experience and practical examples helped to clarify meanings and obviate the kind of hypothetical pondering in which some other groups tended to flounder.

Before moving into a report on the conclusions that emerged from the session on interrelationships in teaching, a summary of the general assumptions on which some of the more fruitful discussions were based is appropriate.

Scope

In delineating the scope of the factor of interrelationships in teaching, it was pointed out that, in simple terms, medical education involves two principal participants: student and teacher. Their free and effective communication in a university is essential; the curriculum and facilities utilized in achieving the objectives of medical education come next in importance. The curriculum or schedule is simply the means of formalizing the interrelationship of each factor in the learning process: (a) disciplines or subject material, (b) personnel, as teachers and students, (c) facilities, as classrooms, laboratories and hospitals, (d) techniques and methods of communication and learning, as books, lectures, conferences, experiments, examinations, and (e) the temporal relationship of each constituent factor to the others.

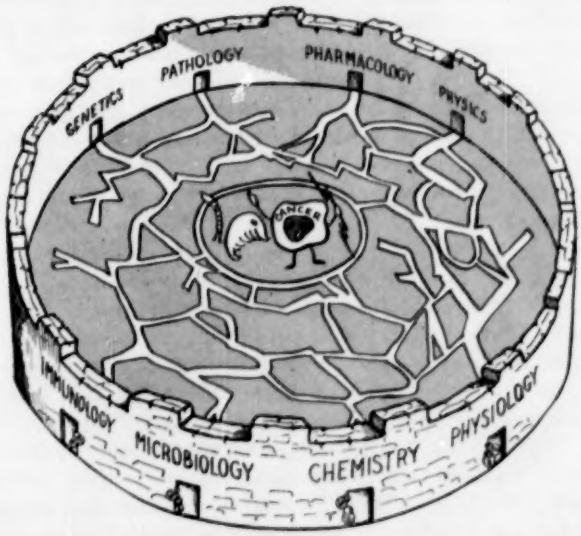
Only through a proper perspective on the relative importance of the student, teacher, curriculum and their interrelationships can the desired



"And this one shows the man-hours wasted by Statistics in computing the man-hours wasted by Planning in estimating the man-hours wasted by Co-ordination . . . "

Reproduced by permission of the Proprietors of PUNCH.

A BIRD'S EYE VIEW THE CITADEL OF MANY GATES



Modified version of a drawing in a book by Bernhard Steinberg, M.D., "It Was My Idea" (1951).

PLATE I. These cartoons, illustrating some of the problems of interrelationships, were shown at the general session preceding discussion of that topic.

objectives of medical education be achieved. It is as erroneous to state that the curriculum is unimportant if the student and teacher are good, as to say that a good student with a proper curriculum will learn enough despite a poor teacher. Improvement in medical education should be sought at each and every susceptible point, including their interrelationships.

Three general levels of relationships of disciplines in the teaching curriculum were defined:

Cooperation. Cooperation in the curriculum would refer to the agreement of two or more individuals with respect to one or more facets of their teaching. Such relationships are experienced, in part, by a significant percentage of teachers who are speaking acquaintances of their colleagues.

Correlation. A correlated curriculum implies the bringing together in suitable relationship of two or more subjects or disciplines. This may be only a temporal juxtaposition of class periods or may be more highly correlated to involve objectives, content, personnel and teaching methods.

Integration. An integrated curriculum implies a closer synthesis of personnel and methods of teaching to achieve a common objective. To some teachers there is an implication of a greater change than in correlation, a change which may require an analysis and segregation (disintegration) before the reconstitution or integration of curriculum is achieved.

It is generally accepted that integration of concepts and facts, which is necessary for proper learning, occurs essentially in the mind of the student. This process of integration cannot be accomplished for him either by teacher or curriculum, although both may aid in achieving it.

On a temporal basis, correlative teaching has been classified as backward or forward as relating to preceding education (as a pathologist making rounds in the anatomical dissecting laboratory) or to following material (as the microbiologist participating with pediatrics in a conference with senior students on infectious diseases).

Teachers with geometric concepts have referred to horizontal correlation as it applies to the same year; vertical as applicable to preceding or following years; oblique or diagonal as a combination of horizontal and vertical. An additional type suggested in the informal atmosphere of the Teaching Institute was dubbed "spiral"—to wit, that version "in which everything gets screwed up."

Consideration of the subject of correlation and integration is one which many teachers cannot approach without some potential bias of perspective on the basis of past experience or future apprehension. Many of the biochemists, physiologists and pharmacologists who attended the 1953 Teaching Institute had had substantial reservations about doing any correlated teaching. Most pathologists and microbiologists at the 1954 Institute thought that the moderate amount which they were already practicing was desirable. Many clinical teachers felt that in much of their teaching at the bedside they had been personally correlating all disciplines as they relate to the patient. In accordance with their personalized interpretations

of definitions, some proponents of change were inclined to refer modestly to their own curriculum as "an experiment in correlated teaching" and derisively to that at other institutions as "an adventure in integration."

Most pathologists and microbiologists were inclined to believe that limited correlation and integration is beneficial but that its success is frequently a matter of the personalities involved. The timing of the effort at correlation was considered very important, but there was disagreement as to what constitutes the proper time. It was suggested that correlation should take place when the student needs to apply his basic knowledge, but teachers disagreed as to how much basic knowledge is necessary before the correlation should be started. Most pathologists and microbiologists felt that correlation such as the discussion of cases by representatives of different specialties was highly desirable in the last two years when the student had the basic concepts with which to work.

Factors Involved in Cooperation, Correlation and Integration

Adaptation to local structure

Conspicuous in the discussions as they developed at the Teaching Institute was a judicious reluctance on the part of those who had successfully practiced some degree of integration to urge their particular structure upon other schools. It was generally recognized that in this area curriculum innovations should be custom-built to fit individual needs and should be adapted to the special requirements of widely differing institutions. What was successful in one was not *ipso facto* applicable to another. Caution was recommended, however, against prejudgment on a subject so full of emotional implications to many faculty members. Individual interpretations would naturally vary widely with one's objectives, local situations and the practicalities of developing programs under various existing conditions.

Initiation requires staff support. It was agreed that a paramount factor in starting programs for cooperation, correlation and integration in teaching is the opportunity for its inception. It is obviously simpler to make extensive changes in a curriculum under conditions in which a new institution is being established or when there are substantial changes in staff or factors which effect an alteration in faculty outlook. It is difficult to bring about changes in curriculum by getting departments to make extensive alterations in their own pattern of teaching unless there is some desire on the part of the faculty concerned to participate in the creation of such a change. In fact any cooperative, correlative or integrative venture in teaching is likely to be doomed to failure without considerable motivation on the part of the staff concerned with effecting such a change. In some instances in which attempts have been made to force such changes in curriculum, development of disintegration has taken place instead. Caution was expressed against setting up a tsar-type of authority, or oligarchy, as an "easy" administrative mechanism for creating such curricular changes.

Some teachers from the medical schools felt it would be preferable to bring about changes in the curriculum slowly on the basis of the mutual desire of the individuals concerned, effecting a gradual change starting with minor cooperative enterprises in teaching and leading eventually toward more complex correlative programs. Others, however, expressed the opposite view—that since change *per se* is by nature disturbing to some individuals, it would be better to consummate the entire reorganization at once, granting minor subsequent readjustments, rather than perpetuate over a period of time a fluid and potentially unsettled curricular atmosphere.

Teaching principles

Outspoken critics pressed the point that, carried to an extreme, correlation may attempt to teach some things which could far better be taught in the more conventional manner as individual disciplines. A proponent of correlation pointed out that this possible criticism was more quantitative than qualitative. "Any teaching," he said, "whether conventional or unconventional may be good or bad, and the opportunities for poor teaching are just as good in the conventional as in the correlated or integrated teaching program. It is certainly a debatable point whether the good teacher cannot teach effectively under either type of system. The basic logic behind the emotional pleas which one occasionally hears—that integrated teaching is anti-intellectual—is often lost on those who have had experience in this type of teaching and enjoy cooperating with their colleagues."

It was further suggested that, inasmuch as the mental process of integration must occur within the mind of the individual, the integrated presentation of a subject can take place better through a single teacher rather than several. Some felt that the student is not prepared to carry out his integrated thinking processes until he has finished his basic science indoctrination and is then taught at the bedside by a clinician who guides him in his correlation of information relative to the patient and his illness. Others shared the opinion that there is an opportunity for correlated teaching in conjunction with the teaching of basic science material. Because of the increasing complexity of our fundamental knowledge the clinician is unable to keep abreast of all the necessary details which can better be supplied by a group of specialists cooperating in their teaching efforts, and some sacrifice which the faculty may be required to make in cooperative teaching enterprises was felt more than justified by the benefit to the student in facilitating his integration of subject material.

An objection raised to integrated teaching in the basic sciences was the difficulty of procuring appropriate clinical material at a prescribed time. This would vary tremendously with the local situation and the degree of correlation undertaken. It would also depend upon the teachers' willingness to make the necessary effort to attain their objectives.

Some reservations were expressed lest "a predigested unified concept" be considered by the student as a final, absolute package of knowledge.

Proponents of correlation pointed out that dogmatism in teaching was no more likely to occur in a correlated or integrated program than in the more conventional type of curriculum, but was dependent upon the individuals participating in the teaching. One discussant humorously suggested that, if the subject of pathology could be presented "without confusion," the pathologist had not done his job properly because pathology was a "confused subject." Other pathologists who agreed with this notion to some extent nonetheless maintained that we must "systematize our ignorance" in some fashion for presentation to the student. It was thought imperative to keep what is *not* known about a subject constantly before the students.

Impact on faculty

Time demands. Most participants were in agreement that any major change in cooperative, correlative or integrative teaching would place additional demands upon the staff teaching time, the degree of which would be entirely dependent upon the program to be undertaken. Where extensive changes are contemplated, considerable time is required for adequate planning. Actual teaching time need not be increased when the plan is in operation. In the experience of several faculty members employing correlative teaching, less staff teaching time was required because of the elimination of undesirable duplication in teaching efforts by various teachers. The point was made that one of the principal reasons more teaching time is required in such programs is that a closer student-teacher relationship results from the change-over. For example, if the teacher holds conferences with a group of eight students, this means twice as much time per student as at a prior conference held with 16 students, regardless of whether the teaching is being done by more conventional methods or through some type of correlated program.

A large staff is customarily included in plans when correlative teaching is contemplated. This, although a problem to the administration, may be welcomed by the student and the fellow teachers for the division of teaching responsibilities and increased faculty contact with students.

If increased demands for teaching time are placed upon the staff, loss in time for research may result. In major changes of curriculum aimed at increased correlation and integration, it is often necessary to arrange the teaching schedule so that some of the departments teach at irregular time intervals in order to make proper adjustment for teaching subjects of varying importance which require different spans of teaching time. Even though a teaching schedule is made out a year in advance, it is disturbing to some faculty members to teach on Tuesday one week and Thursday the next. Others are able to arrange their research and responsibilities to conform with a fluctuating schedule and show up promptly for all of their classes.

Fear of regimentation. Some participants at the Institute feared that correlated and integrated teaching would involve regimentation which might curtail faculty development. Over-planning of teaching methods

might defeat the fluidity of instruction widely considered necessary for good scholarship. It was admitted that those with aversions to cooperative enterprises in general would probably feel regimented under any teaching system in which they were not given complete freedom. As one participant commented: "Certainly in some departments domineering individuals may attempt to force their ideas on young instructors and regulate precisely the way and manner in which teaching is carried out. Cooperation and freedom are not necessarily completely antagonistic terms, although under some circumstances one who cooperates may lose some degree of his freedom. Complete freedom in the extreme sense of meaning of the word is indeed rare in modern society, and we are concerned here with a relative matter in which it is impractical to generalize our conclusions." A discussant who had participated in an extensive program of correlated or integrated teaching expressed the opinion that it produces a healthy atmosphere of experimentation and change, which should be highly stimulating to the young teacher and offers a high degree of freedom for development of his initiative and teaching ability.

Fear of insecurity. In the frank and informal atmosphere of the discussion group several reservations against correlated teaching were voiced which involved fear of insecurity. Would there be invasion of the teacher's sphere of influence, and would teaching prerogatives be removed? Will he lose his esteem as a member of a discipline if he cooperates in teaching with members of other departments and comes into close contact with those who have specialized knowledge he does not possess, and who may question some of the statements he may make? There was concern lest specialist categories and departments might be dissolved with some loss of "protective barriers." Reassurance came from other colleagues who held the idea that substantial benefits accrued from the reduced departmental competition for prestige and student time which accompanied integrated teaching programs. One teacher pointed out that this problem was a highly personal and individual one. "Some individuals have survived and even enjoy participation in the most extensive integrative teaching programs in this country, whereas we all know other good teachers who live and will continue to live in constant fear and insecurity of their personal positions."

Submersion of departments. One of the representatives from a school enjoying a successful degree of correlated teaching summed up his views on the merging of the identity of some departments in the joint teaching effort: "The concepts of teaching a subject as a distinct discipline may be partially lost in extensively correlated or integrated teaching programs. If, for example, the teaching of five departments is replanned on a single framework, each of the five departments cannot continue to teach exactly as before. If, for example, a department of microbiology thinks that the discipline it represents can be properly presented to the student only in a set and presently determined sequence of presentation, or if a department of pathology is convinced that it cannot properly teach diseases of the nervous system prior to those of the cardiovascular system,

there will obviously be difficulties in developing a closely correlated teaching program between two such departments. If there are not sufficient benefits to be attained by having departments and individuals give up some of their present teaching fads and concepts, curriculum changes involving a high degree of correlation or integration should not be undertaken."

Personal adjustments. Since any cooperative enterprise requires suitable personal relationships among the individuals concerned, correlation entails some opportunity for friction and conflict of personalities. Teachers with some types of personalities would do better in cooperative efforts, whereas others would encounter difficulties.

It was, on the other hand, suggested that correlated programs might bring the basic science and clinical departments together physically and mentally—thus benefiting teachers with the opportunity of acquiring knowledge of other disciplines, a breadth of viewpoint and the enrichment that comes through shared planning and exchange of ideas.

Some teachers with medical training expressed the belief that the teacher trained as a Ph.D. was less qualified to participate in correlated teaching, and often afraid to do so. This was hotly contested in several groups in which the subject came up. The consensus was that many Ph.D.'s showed great enthusiasm for embarking on such experiments; which was much more than the expressed interest of one pathologist who, when asked whether he participated in correlated teaching with clinical departments, admitted "we do mingle with the clinicians."

Physical and fiscal factors. Another objection raised to developing highly integrated teaching programs was that it was said to be costly with respect to building space and to require special construction. It was questioned whether highly integrated programs could be developed when the departments were physically separated. To quote one rebuttal: "This depends upon the program, facilities available and relative degree of atrophy of ambition and organs of locomotion of the faculty members concerned."

On the basis of reported experiences the participants concluded it was impossible to generalize on costs involved in a change-over to a more correlated curriculum. Numerous examples were cited of minor changes in programs which resulted in no increased cost or in some possible saving. Examples were also mentioned of institutions in which complete revisions had taken place in the curriculum at no significant increase in cost other than additional faculty members who were added to give a better ratio of teachers to students—an increase which would have been required with improvement of conventional teaching methods. In other cases institutions have received and utilized large sums of money to effect curriculum changes. It was agreed that a budget increase, if not prerequisite to consideration of change in the teaching program, is certainly salutary.

Effect on the student

What is the effect upon the student of attempting to correlate the teaching approach?

The semantics of the word "correlation," and a divergent interpreta-

tion of its implications, was implicit in the discussion of this factor. To some representatives of the medical schools, "correlation" meant oversimplification which might mislead a student into thinking he has been given all necessary knowledge of a subject in predigested form. Some feared that the student might lose the stimulation of self-education by thinking it unnecessary for him to integrate the facts and concepts encountered. The immature student might lack the basic information and experience necessary for proper correlation.

The proponents of correlated teaching questioned the validity of these suggestions for any student mature enough to belong in medical school. They claimed that under a correlated teaching program the ultimate integration of facts and concepts which the student must achieve was made easier, and as a result his learning was increased. Free time for the digestion of facts and concepts might also be made available. The traditional confusion created in his mind by the presentation of related material at very different periods in his training, frequently in a highly fragmented manner, would be replaced by a method of presentation in which the student might view as a whole and at one time the various relevant factors bearing on one subject.

Some "doubting Thomases" of correlated teaching suggested that such programs might eliminate desirable repetition which is essential to the learning process. This was disputed by the claim that undesirable repetition would be eliminated, with a consequent time-saving for the student and elimination of a degree of conflict of opinion between different departments. The consensus was that some repetition was desirable in teaching. One proponent of correlated teaching commented as follows: "It is not necessarily an inherent attribute of either the more conventional methods of teaching or of the correlated or integrated programs that they involve either excessive repetition or undesirable lack of repetition. As teachers become aware of what is being taught by other faculty members, one might expect some reduction in repetition and some clarification of presentation of concepts, but it is not necessary that this be carried to an undesirable degree. It is desirable that there be planned as well as chance repetition in teaching, from which the student will benefit, regardless of the name placed upon the type of teaching curriculum used."

From the student's point of view, if not from that of the faculty member concerned about the welfare of his specialty, some advantage was discerned in a de-emphasis in the medical specialties in undergraduate teaching. One senior student had succinctly expressed this view in the questionnaire sent to him: "Integrate, man, integrate—don't be so damn narrow-minded about one field."

If a correlated teaching program were to include the introduction of some clinical material into the teaching of the first and second years, some feared lest the student's mind be diverted from the study of fundamentals by the glamor of contact with a living patient. Others disagreed. They pointed out that the introduction of such material increases the student's interest and motivation in studying his basic science material through the

suggestion of future clinical applications which illustrate their importance and potential significance. Motivation to learn was generally accepted as a vital factor in medical education. Delegates from two schools where a high degree of correlated teaching had been introduced in the first two years of medical school reported that the clinical staff thought the students better prepared to undertake their clinical studies in the third and fourth years.

In conclusion, one of the participants commented: "It may be that the principal benefits which stem from experiments in cooperation, correlation and integration in teaching are in favor of the medical student. Since he is the reason why medical schools exist, such advantages may justify the variable degree of sacrifice of independence of planning and action required by some correlated or integrated programs."

Approaches to correlated teaching

Slow, orderly development urged. Careful detailed planning of every procedure was stressed as essential before embarking on any approach to correlation and integration. Generally a slow, orderly development with evaluation at each step was thought preferable to more precipitous action —described in one group as the "pouring on from above and see what floats" approach. Integration should not be attempted with the idea of creating a oneness but rather to communicate a sense of the meaning of correlation. Careful sense of proportion should be exercised in timing. In many institutions it might be considered preferable to maintain a high degree of departmental integrity, with teachers cooperating as individuals. Younger staff members might be encouraged to explore all possibilities for correlation with other departments while preserving the respective departmental identity. In the opinion of many pathologists, their discipline should be taught as a correlated science and as a part of the science of medicine.

CPC's and other correlation clinics. It was brought out that at present almost all schools have certain exercises or courses which require a high degree of correlation not only in teaching within individual departments but as cooperative enterprises between departments. These may include clinical pathological conferences, tumor clinics, correlation clinics and orientation clinics and some combined departmental elective courses. Although the degree of success in such an undertaking varies between institutions, the clinical pathologic conferences generally are an outstanding example of such a correlated participation in a conference and are highly regarded by students and members of teaching faculties.

Lectures. Other means of correlation discussed included lectures for students in the clinical years by basic scientists and lectures for students in basic science by other specialists. Teachers with points of view different from those of the department might confuse the student, but this need not eliminate the possibility of their participation. Correlation of departmental activities in teaching could be fostered by staff attendance at student lectures in other departments. The course content could be mime-

ographed and distributed to other departments in a mutual exchange of information. The exchange of staff, usually junior staff members, for a period of several months at a time might provide a good foundation for understanding of teaching between departments.

Autopsies. The autopsy, when studied primarily by the case method, provides a natural instrument for integration of the student's knowledge much as the patient on the wards or clinic. A further important example of cooperation between microbiology and pathology is the suitable use of microbiology in studies of surgical specimens and autopsies. This was particularly stressed because of the use of antibiotics in changing bacterial diseases and in the necessity of re-evaluation of recovered bacteria in the light of antibiotics used.

Elective courses. Elective courses were designated as affording an excellent opportunity for interdepartmental cooperation in teaching. Such courses might involve many areas of interrelationships among, as well as within, disciplines. The introduction of elective courses for junior and senior students wishing additional experience in basic sciences has worked satisfactorily in a few schools for some time, according to report, and is being introduced into some additional institutions.

Examinations. If one of the purposes of medical education is to teach students facts and concepts which they will correlate and integrate, examinations designed to measure the degree of success achieved in this are essential. Too frequently, it was thought, examinations put undue emphasis on isolated factual or technical knowledge.

It was evident that, in cases where departments cooperate in teaching, some form of cooperative effort was appropriate in the preparation of examinations. One participant pointed out that, since students put so much emphasis on examinations, correlative teaching to be meaningful should be carried through into the examinations. Otherwise the practical value of such programs is not as apparent to the student.

Some faculty members were inclined to think that comprehensive correlative examinations, given only after a considerable lapse of time, might tend to keep a poor student in medical school too long, and in so doing prevent a more competent student from taking his place. They were reminded that correlative examinations need not replace the factual-type examination given more frequently.

A desirable effect of examinations devised jointly by several departments was noted, in that they served to maintain a student's awareness of the application of the various disciplines studied earlier in his medical career.

Correlated teaching in genetics and biostatistics. In exploring the inclusion of more genetics and biostatistics in the medical curriculum, it appeared evident that integrated teaching methods could here be appropriately used.

Ideally, it was thought desirable to have the basic principles of genetics and biostatistics taught during premedical years, with examples of their pertinent application brought in at all stages of medical schooling. Prac-

tically, at present it is necessary to teach such principles as may be imparted early in the departments of anatomy, physiology, pathology, epidemiology and microbiology. Once this basic material is acquired, its application to each of the subsequent disciplines should be shown.

Separate departments or divisions of genetics and biostatistics were not recommended. Preferably such teaching should be done by members of the departments involved without having to rely on one or two individuals to cover the entire spectrum. It was conceded that at present the departments to which genetics is pertinent are predominantly ill-equipped to teach it properly. This situation also exists in biostatistics. Ways of developing an adequate pool of interested teachers trained in this area are discussed elsewhere in the report of the Institute. (See page 22.)

History of medicine. The suggestion was made that thinking might be oriented toward teaching the history of ideas rather than the conventional concept of the history of medicine. This would be achieved in many institutions through the injection of historical facts and experiments related to the subject under discussion in various disciplines. Effective integration of such material in course content would substantially contribute toward the development of a student's overall comprehension of the meaning and tradition of medicine.

Mechanisms for Correlated Teaching

Of the many mechanisms useful in correlated and integrated teaching, three specific examples were defined: (a) cooperation in conferences, seminars and classes, (b) cooperation by juxtaposition of courses with or without fusion and (c) integration by the individual or group of teachers.

Conferences. One discussion group explored the administration of correlation conferences and seminars. It was suggested that it is generally advantageous to have one individual select the topic and arrange for special assignments and participants from various disciplines, making sure that they are called upon at the conference and that they have had time to prepare themselves for their contribution. When a single individual bears the administrative responsibility for a conference, the possibility of his slanting the conference toward his own thinking must be taken into account.

In consideration of the objectives of a conference, different individuals place different emphasis on the extent to which the conference should be directed to a particular audience. A conference marked by good showmanship may draw a large attendance without additional effort of attracting participants. If a conference is adequately planned to meet its objectives, the problem of attendance will take care of itself. On the other hand, if a conference is geared to the interest of only a few individuals who attend, the idea of correlation and broad participation may be defeated.

Invitations to members of other departments to participate in lectures in one's own area may lead to an exchange of information and broadening

of interest on the part of the teachers which can be highly desirable and may exceed initial expectations.

Juxtaposition. It was generally agreed that correlation of teaching by juxtaposition of courses, with or without fusion, was potentially much more complex. More problems may arise because of the involvement of more individuals and departments, both in planning and executing a change, which may necessitate some tampering with the curriculum—a major undertaking in many institutions. The greater the interest of staff members and their ability to cooperate, the more likely such ventures are to succeed. In some instances the juxtaposition of courses so that similar material is taught simultaneously might be a more acceptable and less traumatic procedure than the fusion of courses or the complete reorganization of the curriculum on a totally integrated basis with loss of departmental identity in teaching. Cooperation through juxtaposition of courses might be a gradual step toward fusion of the courses in some areas. One of the chief problems encountered in considering juxtaposition is the necessity of teaching on one unified plan—which obviously cannot represent the former teaching methods of all departments concerned.

Integration by an individual. Integration of teaching by an individual was thought to be relatively simple as compared with an integrated curriculum taught by a group. The individual teacher has usually an unlimited opportunity to carry out correlated or integrated teaching in his individual course. The teaching of sections of a subject matter in medical schools by a closely integrated approach may not raise major problems as compared with those encountered when the entire curriculum is reorganized on a completely integrated basis.

In general the discussants agreed on the desirability of carrying out different types of experimentation in teaching in different institutions. The one or more current examples of reorganization of curriculum on a fully integrated basis need not necessarily be duplicated until there has been more opportunity to gauge their success.

Survey of existing experiments recommended

Many teachers are unaware of what is going on in other schools, and experiments in teaching often go unrecognized because they are considered conventional teaching methods by those using them. The questionnaires submitted in conjunction with the Teaching Institute revealed valuable information[1]—although some participants expressed regret that many details useful to anyone else wishing to undertake similar experiments were not included. Because of the potentially great aid to other

1. Some useful information may be obtained by reference to Table 6 which indicates some of the types of experiments instituted in various medical schools. Additional details regarding the institutions involved in such experiments may be obtained by consulting the office of the Association of American Medical Colleges. Further details could be sought from the respective institutions. Some of the institutions which are involved in more extensive experiments are Western Reserve, University of Kansas, University of Colorado, Bowman Gray School of Medicine in the undergraduate curriculum and Harvard Medical School in the medical sciences.

institutions in the process of planning experiments, it was suggested that a more detailed survey be conducted with respect to experiments presently under way.

It was felt that the available data on experiments in teaching do not in general present a clear picture of their relative success. Some faculty members strongly urged the need for fundamental studies on current methods and practices in medical education.

One of the more interesting examples of the experimental approach applied at the Teaching Institute was the endeavor of one group which set itself up as a hypothetical committee composed of members of the departments of microbiology and pathology sitting together to arrange a completely correlated program. Surprisingly little disagreement was encountered, and it was felt that much could be done along this line with little effort. One microbiologist commented that the "material falls together naturally." It was, however, emphasized that circumstances in different schools would determine the feasibility of such experiments. (It was whimsically suggested that the apprehension of those present might have been greater had they known that the program they were discussing was actually to be introduced into their own school.)

Great differences were foreseen in the relative ease with which experiments in correlated teaching might be introduced in different areas. For example, experiences with cooperative effort among members of the departments of pathology, microbiology, clinical pathology and public health and preventive medicine were reported as having been more successful than those between these same departments and, for example, psychiatry.

Theoretical versus clinical approach

The largest part of the teaching effort of the departments of microbiology and pathology centers in the second year of the curriculum. Problems concerned with correlating the teaching of these and other departments at this time might be considered of the so-called "horizontal" correlation type. An inherent problem in such teaching involves the relative emphasis on fundamental theory versus clinical application. It was agreed that each student must have basic knowledge of a discipline before correlation can become effective. For example, in microbiology this would include the principles of fundamental bacterial growth and metabolism. Disagreement was expressed as to the ratio of practical and theoretical education a student should receive. It was also difficult to arrive at specific examples of the usage of each. If too much attention is placed on theories, the student may not become aware of their pertinence in practical application; if the practical aspect is overemphasized, the student is trained in medicine of today and not for the future. Such emphasis may create a trade school instead of university atmosphere. The training of the student should be paramount in considering these decisions—with the defense of a particular discipline being secondary.

In general, all agreed that the inclusion of clinical applications stimu-

lates student interest. The extent to which the technical procedures of microbiology and pathology should be taught was debated. The student might some day need to know the specific techniques of microbiology; but the desirability of his spending a significant part of his limited time studying detailed techniques that would be used by only two to five per cent of the class was open to question. A major value of such training is to make the future doctor aware of what he asks for when he requests a technical procedure from the laboratory. It also gives an understanding of principles, biologic variation, and accuracy of results.

Concern was expressed lest the student acquire false impressions as a result of clinical presentations against a background of limited knowledge. Some questioned whether these false impressions were sufficient to interfere with their subsequent development. However, as one participant expressed it, "life consists of correcting one false impression after another; the interest stimulated probably would outweigh the hindrance of false impressions."

Some discussants feared lest abbreviation of existing courses to allow introduction of others might lead to a scattered, superficial coverage of many subject areas with a consequent dilution of overall medical training. They questioned whether the limited exposure to the philosophies and techniques of a variety of disciplines was harmful, giving the student a false sense of ability and fostering overconfidence. It was contended that in general pathology, for instance, the microscope gives the student a world of his own—observations and experiences differing from those of anyone else in the class. It affords him a situation where he can learn to observe and synthesize his observations in a way that cannot be achieved via colored photographs and correlation clinics.

Among the provocative comments heard in discussion sessions at the Institute were such as: "Bring down to pathology and/or microbiology clinical material but not the clinician" (since the clinician may not be aware of the student's level of information at that moment); and "presentation of clinical material should be given by the department or individual in the basic science; the clinician must be used with caution and prudence."

Although opinions differed as to details, the majority of pathologists and microbiologists present felt that clinical material could be used effectively both in direct teaching and in comprehensive examinations centered around a case problem. Judicious care, however, should be exercised lest the student concentrate on the patient and miss the principles illustrated.

Attention was called to the fact that pathology and microbiology have a similar origin and in earlier phases of teaching, in many instances, were part of the same general discipline. They therefore present an unusually good opportunity for cooperative efforts in teaching.

Vertical teaching

In most institutions, the first year of medical school is largely occupied with the study of normal human biology. Since pathology and micro-

biology are concerned with the teaching of the biology of disease, to which this knowledge of normal function and structure is a prerequisite, there is little need to inject subject matter from these disciplines into the first year. In some institutions a pathologist may occasionally make rounds at the anatomical dissecting table and discuss briefly with the students something of the gross pathology which they have encountered in their dissections. The stimulating effect which this may have on the student must be weighed against the possible diversionary effect on his study of normal anatomy. The role of the pathologist and microbiologist in first-year teaching might be compared to that of the clinician in motivating the medical student.

A difference of opinion existed as to the desirability of increasing the teaching of pathology and microbiology in the third and fourth years by members of these departments. Many discussants recognized the need for more participation by microbiologists but pointed out that pathologists already give considerable time to such teaching. It was agreed that the third and fourth years are the ideal time for the student to gain a fuller understanding of the practical application of pathology in human disease. The pathologists at the Institute generally thought it important that the pathologist play some role in the teaching of the junior and senior medical students at this important stage in their training. This would help the department maintain contact with the students, illustrate for them the importance of the practice of pathology, and as a result would significantly effect the recruitment of some of the more promising students into pathology as a career. Several pathologists suggested that it might even be desirable to relinquish some of the time in the sophomore year for more active teaching in the junior and senior years. The teaching of surgical pathology, which occurs during the third and fourth years, provides an excellent opportunity for cooperative effort with the department of surgery.

The microbiologist participates even less frequently than the pathologist in teaching programs in the third and fourth years. In some schools, students work up their cases under the cooperative supervision of the clinician and the microbiologist. Such participation by members of both disciplines is often welcomed by the clinicians, even to the point where it puts an excessive burden on the pathologist and microbiologist. Students who may be averse to formal lectures at this point in their training welcome participation in clinical conferences of all types by men from the basic sciences.

Clinical pathology and clinical laboratories

It was generally thought that clinical laboratories and the teaching of clinical pathology represent an important area of interdepartmental relationships. There was some disagreement among nonpathologists as well as pathologists as to what a clinical pathologist is or should be. For the pathologist in an academic medical center, the utilization of the facilities of clinical pathology is necessary for proper pathology residency training

program. Problems were discussed that arose when the administration of the clinical laboratories is under the direction of one or more other departments. No uniform pattern of administration or teaching could be discerned in clinical pathology in academic medical centers in this country, and it appeared obvious that no single pattern could or should be recommended. Although the clinical laboratories may be under the administration of a member of the department of pathology or of some clinical specialty such as medicine, it was the opinion of many that the basic science teachers would obtain valuable stimulation and orientation in their thinking by participating in the supervision of areas of the clinical laboratories pertaining to their discipline. Others felt that the microbiologists and chemists should be protected from the overwhelming burden of routine of the clinical laboratories in order to have time for teaching. It also was thought desirable by many that the basic science departments participate in the teaching of the phases of clinical pathology with which their discipline was concerned. As this type of approach could be carried out in medical schools, it was recommended as affording excellent opportunities for interdepartmental cooperation in teaching as well as in service responsibilities. Most academic medical centers, according to their spokesmen, do not feel the need of establishing a department of clinical pathology equivalent to that of other major disciplines. (For more extended discussion of clinical pathology, see page 14)

Cancer teaching

In exploring likely opportunities for the application of cooperative teaching in medical schools, it was brought out that the need for the skills of a variety of specialists in the diagnosis and management of certain diseases can be a strong correlative force. Cancer was cited as an example. Aided in substantial part by the Cancer Teaching Grants of the National Cancer Institute, coordinators of cancer teaching have been established in most medical and dental schools in the United States and have exerted a notable influence in the improvement of cancer teaching in these institutions. A cancer coordinator acts to unite members of a faculty to deal comprehensively with the many phases and approaches to the cancer problem. His function includes the stimulation of cancer research, exploration of new approaches, development and improvement of cancer clinics and conferences, checking on excessive duplication of teaching material and initiation of his influence into other departments in a proper and diplomatic manner.

The last day of the Teaching Institute was arranged to coincide with the first day of the Conference of Cancer Coordinators held at French Lick, which afforded opportunity for exchange of thought among those attending these sessions.

The tumor clinic. The tumor clinic and tumor conference, which represent generally cooperative efforts of departments concerned with cancer teaching, have had an important influence on the medical student. Most medical schools operate a tumor conference in which cancer patients or pa-

tient problems are presented and discussed, while many schools have in addition a tumor clinic in which the students examine cancer patients and discuss their problems with staff representatives from various disciplines concerned. Tumor conferences may have various objectives, including: (a) a service type of conference stressing better therapy, (b) a conference to stimulate research and (c) a teaching conference. It is desirable that the objectives of the conference be determined before it is set in operation, in order best to serve the student as well as the faculty. Although the service type of conference lends itself to teaching, it can be overloaded to such an extent that it becomes uninteresting both to the participating students and the preclinical teachers.

The basic scientist may derive benefit from more extensive participation in tumor conferences. The individual doing research on mouse carcinoma should see examples of human cancer in order to realize certain fundamental differences between cancer in mice and in men and to get a better perspective on the cancer problem.

Immunologists can also make important contributions to tumor conferences. Human cancer occurs spontaneously, whereas many of the experimental tumors studied in the mouse are transplanted and differ immunologically. Although the pathologist and biochemist have done cancer research work for years, the microbiologist has more recently assumed an increasingly important role in cancer investigation and cancer teaching activities.

Departmental organization and structure

Many diverse views were expressed at the Institute on the question of departmental organization and structure. A satisfactory table of organization in one institution might be unsatisfactory in another because of different personalities and circumstances. Some participants were of the opinion that there should be no limitation artificially imposed by departmental lines especially as it concerns research, and that an individual's interests and activities should take him in whatever direction and to whatever extent his inclinations determined. On the other hand, no one could deny that in many areas there is an increasing tendency towards more sharply defined departmentalization and even subdepartmentalization. Such departmentalization may emphasize the community of interest and the utilization of common techniques by various members of the same specialty. When departments become too large, the increased administrative load, as well as the interference with scientific expansion and development within a complex framework, may justify changing departmental structure. Some felt that little if any improvement in integration of course material is possible in a combined department over what may be achieved by individuals willing to cooperate across departmental lines.

Some of the pathologists in charge of combined departments of pathology and bacteriology had actually recommended separation of the departments. It was their opinion that correlation between the two subjects took place when the departments were separated as well as when they were combined.

One of the problems of a combined department of pathology and microbiology appeared to be that the departmental chairman might not have sufficient breadth of interest to encourage properly the development of all aspects of both disciplines. Although the cost of separate departments might be greater, it was general opinion that the results were worth the increased cost.

The tendency toward specialization and splintering away of subspecialties from pathology was discussed. There was serious doubt in the minds of many whether it was beneficial in the long run to have pathology and microbiology (as they apply to various clinical disciplines such as surgery, pediatrics, ophthalmology, otolaryngology and dermatology, for example) separated from the department of pathology and microbiology and under the supervision of a clinical department.

One participant drew attention to the fact that those schools which have experimented with reducing the numbers of departments had found the administrative burden that devolved on the heads of the remaining large departmental groups made them unwieldy.

Dual staff appointments. The appointment of one staff man to two departments was suggested as a valuable mechanism for achieving interdepartmental cooperation. This should be a true relationship and not merely a paper appointment. He should have an interest, and preferably adequate training, in both fields represented. It was agreed that the proper use of dual appointments depends on finding the appropriate individual to fill local needs.

When dual appointments are made, it would be preferable that both departmental chairmen share in the appointment, to avoid prejudice in favor of that discipline financing salary. Some teachers thought that if a pathologist, microbiologist or other preclinical teacher were to work primarily in a clinical department, it would be preferable that he have a dual appointment involving the preclinical department, in order to maintain his contact and standing in the preclinical science.

Appointment of chairmen from other disciplines. One facet of the problem of departmental organization discussed at the Teaching Institute was the appointment of chairmen not qualified in the fundamental basic discipline of the department. An example would be the appointment of someone trained in internal medicine as chairman of a department of pathology, or the appointment of a biochemist as chairman of a department of microbiology.

Several points were raised regarding the advisability of such appointments, chief among which was that young men desiring to enter the field might be discouraged if they could not look forward to top positions in their chosen discipline. In making such appointments, a forecast of future trends in the field might be a factor influencing the selection of an individual with specific interests. If, for instance, it was felt that bacterial metabolism promised to play a major role in microbiology, a biochemist with background in metabolism might be appointed chairman of a department of microbiology although he had no special training in microbiology. It was

considered important that appointees of this sort should emphasize the broad development of their department. Such appointments so far were described as relatively few in number but comparatively successful—although at the time they had a disconcerting effect on younger members of the discipline aspiring to become departmental chairmen. It was suggested that such pilot episodes might constitute a healthy challenge to the chairmen of other departments of pathology and microbiology to make their own programs more dynamic.

Relationship with other community institutions

Finally, attention was focused on the important potential interrelationships among medical schools in different parts of the country as well as abroad. For the teacher, the cross-fertilization of ideas through visiting teachers might be helpful. A visiting lecturer for a short period of time was thought not as beneficial as one remaining for a longer period who would have more opportunity for familiarizing himself with local needs and trends.

For the student, moving from one school to another was not recommended. Although there were theoretical advantages to the breadth of background acquired by attending more than one school, they were outweighed by the financial burden involved, the necessary readjustments on the psychological as well as the scholastic level and difficulties of meshing the curricula.

It was emphasized also that individuals from other community institutions might provide useful service in many ways as part-time teachers or investigators. For example, the practicing hospital pathologist might bring desirable viewpoints to the student different from those presented by full-time teachers with limited service responsibilities. Such part-time instructors from other institutions might play an important role in providing material not available in the departments, such as in forensic pathology. Stimulation of research activities in non-university hospitals could also result from such interchange of personnel.

Microbiologists have the opportunity to make use of official health department staffs as well as other hospital staffs and similar groups. Some departments of pathology now utilize the staffs of law schools or coroners' offices in conjunction with teaching forensic pathology. An exchange of students between a medical school and a law school provided the medical students with an opportunity to participate in mock trials. Members of the staff of a theological seminary, it was pointed out, have been involved in such ethical problems as determining just what a cancer patient should be told.

These were cited as examples of the fruitful possibilities for cooperation and exchange inherent in a community which, if utilized, can enrich the medical curriculum and incidentally enlarge the usefulness and impact of the teaching institution. The representatives of the medical schools were in agreement that this area merited considerable future exploration.

Need for further experimentation

Time and again discussion at the Institute came up against the lack of satisfactory means of evaluating experiments in medical education. A suitable evaluation would need to take into account comparable control and experimental groups with determination of results over a 10- to 30-year period, including the students' ultimate success in the practice of medicine. This is impracticable, owing to the fluctuating variations in numerous factors, including enthusiasm and competency of the faculty, teaching methods employed, changes in factual knowledge and objectives in teaching, as well as "success" in practice. Some of those actively engaged in correlated and integrated experiments in teaching expressed an acute awareness of the need for experimentation in medical education, even though in many instances such experiments could not be set up as though they existed in the laboratory. Some means of evaluation can be found, it was insisted, even though they are of limited accuracy. As one faculty member, enthusiastic about the success of the correlated teaching program in his school, expressed it: "Scientists and teachers who wish to carry their zest for experimentation into medical teaching will not be deterred by the present lack of fully satisfactory methods of evaluation. Some of the great experiments in education in the past were decried as anti-intellectual in their day; today they are recognized for their true worth. This in no sense is advanced as an argument in favor of that which is criticized. It is rather a plea that those who wish to experiment, experiment. Others who prefer to do so may continue with their own chosen teaching methods."

V. The Student

THE MAJOR OBJECT of teaching concern, the students themselves, drew a large share of attention in discussions at the Institute. Although not personally represented, they were made articulate by means of a questionnaire conducted prior to the conference by the Association of American Medical Colleges. Their opinions and problems, as brought to light by this survey, afforded much specific factual data as basis for fruitful discussion. While making no startling revelations, the questionnaire served to point up areas deserving of increased faculty attention. The discussants were forcefully reminded of the persistent need for perspective on students' problems and the influence of personal factors on their medical schooling.

Financial problems

It was evident from the questionnaire that, although students contribute a considerable amount of money toward their medical education, most of them have neither saved enough nor earn enough in school to cover expenses. The sophomore students polled expected to have a debt at graduation of approximately $3,500. Seniors in 1954 foresaw a somewhat lower figure. The majority work during the summer and save an average of $400 per student. Many too are employed during the school year. Of the sophomores reporting in the spring of 1954, only 30 per cent stated that they had not worked during the year; 45 per cent had not worked during their freshman year.

Some discussants were inclined to think that the questionnaire did not reflect the true financial situation of students. They thought the total debt should be "broken down" to show sources, such as money borrowed from family, etc.

Effects of financial stress. In answer to a direct question on the questionnaire as to whether financial problems had been sufficiently severe as to interfere with their studies, 60 per cent of the single students replied that they had not. Among married students, only 45 per cent admitted to being free of financial anxieties. However, the harassment was not regarded as severe except by a small proportion.

The discussion of participants at the Institute indicated general agreement that financial problems were not as severe at present as they were, obviously, during the thirties. Only infrequently do students drop out of medical school because of lack of funds. A more likely casualty is the brilliant

potential student deterred from applying for admission in the first place. Financial stress also influences postgraduate choices (more frequently in the case of married students). Promising students may forego additional training in specialties. Also, many who might otherwise consider academic careers are persuaded to enter the more lucrative field of private practice to repay loans or compensate their family for a period of poverty.

Faculty guidance committees urged. Although only a small proportion of students are afflicted with financial problems serious enough to impair their efficiency, it was agreed that this should be a matter of faculty concern. It was urged that faculties keep closely informed as to students' financial situations and be ready to give careful guidance in planning solutions to their problems. The suggestion was made that there should be a committee within each medical school to furnish such guidance.

Medical schools might get financial data concerning students before they entered—without making the absence of means a basis for refusing admission. One participant pointed out that financial needs for educational purposes should be sharply differentiated from those for personal needs such as luxuries or social and fraternal societies.

Scholarship loans. The relative value of scholarships, loan funds and subsidies was discussed at length. In general a great need was expressed for (a) better loan fund utilization, (b) more adequate scholarships and (c) research grant assistance for summer and part-time work.

Many students do not know about the funds that are available. Scholarship funds were stressed as more useful than loans which tend to shorten a student's postgraduate training. All medical colleges, the teachers agreed, should supply scholarships and jobs within the limits of available resources. They expressed the hope, too, that charitable foundations and government agencies might be encouraged to provide more assistance to promising students.

Student employment. Faculties can be more zealous than at present in developing further opportunities for student employment in professional activities with remuneration. Examples mentioned included the student research project by the National Foundation for Infantile Paralysis, the Lederle Student Fellowships, student research fellowships and provisions within research grants for student employment.

In general it was felt that the effect of employment on academic standing during the second year was not great, provided work hours were not excessive. Work in the freshman year was considered unadvisable.

In contrast to the concern expressed by many teachers about students' financial worries, one discussant pointed out that there were cases where students were not deeply enough concerned with their financial obligations. Their unrealistic attitude might well be tempered by thoughtful advice of a different sort.

A member of the Institute commented that, as a modern equivalent to the Hippocratic Oath (requiring of each physician that he pass on the art without a fee), doctors today might accept an obligation to contribute money to medical schools for the continued support of education.

Marital status

A third of the sophomores queried in the spring of 1954 were married. More than half of the seniors were married at that time. Thirteen per cent of the sophomores and 27 per cent of the seniors had one or more children.

It appears that the marital status of a student does not noticeably affect his class standing. On the contrary, many discussants at the Institute cited individual examples of outstanding students with family responsibilities. Some thought that more superior students were married than were those of poorer standing. After an initial post-marriage period of a few months students adjusted to their new status and went on much as before, except for times of crisis.

There was general conviction, however, that marital status exerted a marked influence on a student's selection of a profession. The pressure of having a family to support might not strip a good student of his working efficiency. It did, however, take a spectacular toll in his choice of internships and training. The pathologists and microbiologists present at the Institute were in rueful agreement that married students were less likely to assume the long postgraduate study periods with little remuneration that are required for specializing, and were equally deterred from entering academic life and the teaching profession. More than half of the students queried had replied that they felt too much time was required to prepare for teaching.

Some teachers suggested that this trend might be combatted by making subsidies available for capable graduate students interested in teaching, which would enable them to live without undue privation while they finished their schooling.

Inevitably they would encounter the lower salary scales of academic life compared to private practice. This appeared to be less of a factor to students than to teachers when evaluating advantages and disadvantages of the teaching career.

Student health

One might expect that in a medical school where the two subjects of paramount interest are student and illness, student illnesses would be an area on which comprehensive information was available. This was not the case. In the discussions of health problems, a lack of factual material was repeatedly evident.

It was conceded by many that the health problems of medical students loom larger than those of other groups of comparable age, because of physical fatigue, poor physical fitness, exposure to infectious agents, and extraordinary life stress. Most students now enter medical school with negative tuberculin reactions, and the highest rate of development of clinical tuberculosis is during the course in pathology. A continuous check on symptoms through x-rays and tuberculin-testing was deemed necessary. The use of BCG vaccine was also recommended by some.

One participant who had been a student health officer described the health service which was a basic concern of one of his medical school departments.

It was headquartered in the school, was open all day, and attended regularly by a sympathetic R.N. or M.D. alert to neurasthenic trends.

Functions of a good student health service as analyzed in one discussion group were (a) a testimonial of medical school concern for the student's welfare; (b) an agency for immunizing students; (c) an agency for elementary diagnosis and treatment, or referral; (d) a listening post for trouble among students, such as discontent or actual epidemic illness; (e) an agency for remedying trouble among students; (f) special activities which might include transfusion donations, or even room rentals and (g) a place for fourth-year medical students to acquire experience.

It was noted that neurasthenia and acute anxiety states are not uncommon, particularly around examination time. Real psychosomatic states (gastric or duodenal ulcer, mucous colitis, hives) also tend to cluster around the same time.

Psychiatric difficulties

It was concluded that the incidence of psychiatric disorders among medical students is fortunately not large, but that many cases constitute serious problems. The teachers felt that emotional instability was present, albeit latent, when the student was admitted to medical school. Committees on admissions should be aware of students with latent problems which might become overt under the stress of medical school.

Some members of the Institute commented on the preoccupation on the part of many medical students with matters of security and mental health, and a belief that psychiatric care was needed and could help. It was pointed out, however, that this was probably symptomatic of the times—and connected with current popularity of psychiatry and increased attention to psychosomatic medicine. One discussant suggested that a similar preoccupation was evident among faculty members and wives.

A need for additional information on this area was strongly evidenced in the Institute. It was felt that neuroses or psychoses were responsible for the failure of about half the students who dropped out during the first year.

Undue apprehension. Familiar to teachers is the phenomenon of apprehension associated with various stages of medical schooling. Much discussion at the Institute centered around whether this apprehension was of sufficient degree to constitute a problem for faculty attention. It was recognized that stress and some anxiety are a part of normal life, and the physician faces many situations where these are acute. The majority of participants at the Institute, however, seemed to feel that the stress and anxiety experienced by medical students were beyond normal expectation.

Multiple anxieties. Some teachers expressed the opinion that psychological problems, though numerous, were mostly minor and related to multiple sources of anxiety in the student's life—competition, fear of failure (especially acute in regard to examinations), conversion of their methods to those of active rather than passive learning, fear of illness, financial pressure, celibacy or family problems. Mitigation of these anxiety-producing forces might be achieved through alteration of examination procedures, closer

student-teacher relationships, marriage counseling and provision for better living conditions and adequate recreation.

The prevalence of real psychosomatic disease states around examination time indicates this stress at its peak.

Frequently it was noted that the good students were the most fearful of failure. Instances were cited of students doing acceptable work who dropped out of school because of the pressures involved. In some cases they had withstood serious stress in the armed forces or endured other similar experiences without undue reaction.

Grades and examinations. Many teachers felt that grades or other means of student evaluation were chiefly responsible for extreme apprehension. It was hoped that solutions might be found through the elimination of mathematical values and greater emphasis on personality development and scientific abilities. "Some apprehension was good but a little went a long way." One participant suggested that hospitals should be encouraged not to ask for data on students applying for internship. This met with major disagreement.

Advisory program recommended. Some teachers speculated on whether the elimination of written examinations would actually result in eliminating tension. It was apparent that student attitudes varied so much there was no set way of handling all. The most acceptable approach was to engender trust and understanding between faculty and students to such degree that enough pressure existed to stimulate industrious effort but not so much that the student became overwrought. In this connection the usefulness of a properly administered student adviser program was discussed. Although many such programs have come and gone without notable success, a member from one school described encouraging results. In this case faculty advisers for the students were selected with care and included only those eager to participate. Only a few senior faculty members joined this effort; for the most part the advisers were instructors and assistant professors. Social meetings between advisor and student group were helpful in breaking the ice for possible future interviews.

From experiences described at other institutions it was apparent that counseling needs are widespread, and such help will be eagerly sought if it is available. At one medical school where an understanding psychiatric counselor was approachable directly, 80 per cent of the students consulted him during their stay in school.

Group anxiety. Some interesting comments emerged on the phenomenon of "group anxiety." A given class would have a decidedly high level of apprehension due to the influence of a few of its members. A fraternity might be similarly affected. Anxiety over possible failure, it was noted, varied greatly among schools and was much more in evidence in some than in others. It was suggested that perhaps medical educators could learn how to put group psychology to use in establishing better mental attitudes among students.

Study habits

It was apparent that inadequate information exists on different study methods and habits among good and poor students. This was designated as a fertile field for investigation by educational groups.

Student-teacher relationships

A strong desire was manifest in discussions at the Institute for closer student-teacher relationships. It was agreed that this might be fostered by various methods, all approximating a "graduate school" atmosphere. Dormitories, student clubs and planned parties help. But individual efforts of a teacher to be friendly and make himself available for counseling were emphasized as most important. A "wives club" was described, in which wives of medical students were counseled by faculty wives concerning their husbands' problems.

The informal contact that existed at the clinical level was disclosed in some schools as the chief channel for student-teacher relationships. Research interests and routine work all too frequently monopolized teachers' time so fully that it was difficult to arrange any kind of informal contact. But it was specified as essential that instructors should know not only the names of their students but something of their individual background.

Factors in student maturation

There was much provocative discussion on the subject of a student's emotional and intellectual maturation and the influence of the teacher in this regard.

As described in one group, "at this point the meeting became difficult for the chairman to control. There was a great tendency to divide into spontaneous subcommittees from which might be overheard certain quotations to the effect that 'higher education is the device of the elderly to prevent the too early competition of the younger,' and 'medical education is to medical students as ornithology is to the birds.' "

It was generally assumed that the faculty should be concerned with transforming pupils into students; and even, as one member expressed it, into scholars. This could best be accomplished by treating the students consistently as adult, mature individuals—"with the understanding, however, that some will continue to show evidences of immaturity."

One participant commented that there seemed to be noticeable maturation of students during the first year. They then remain at a level of retarded maturation up to the point of graduation. Overstrict curricula design and inflexible patterns of teaching retarded some brilliant students and had a depressing effect on their emotional and intellectual development. On the other hand, many teachers thought "spoon-feeding" necessary for the majority.

Warnings were expressed by some lest the excessive use of electives lead to the development of undisciplined minds. A reasonable balance seemed to be the answer with insistence that basic medical education and the estab-

lishment of broad training and qualifications be established before specialization.

There was discussion as to differences in impact of the teaching given between clinical and preclinical years. It should be made clear to the student that the clinician at the bedside has to be much more definite than the preclinical man in deciding issues, and the student should be aware of the difference between an impression and actual knowledge.

Unscheduled time

Much consideration was given to the factor of free time and its effectiveness in encouraging individual development and initiative. Almost all teachers agreed that some free time was desirable. Disagreement arose over the amount. Estimates varied from zero to 25 per cent of the working week. Chief problem involved was where this might be taken from the curriculum. It does not help the student if a department cuts down its time by 10 or 20 per cent but fails to reduce the content of the course. The lack of available teachers to direct "free time" was noted. One suggestion was made that vacation time be used to reduce the four-year course to three. But for such a purpose the faculty would have to be increased considerably.

Some teachers felt that students might profitably spend one afternoon a week doing library research or some experimental work. Others were inclined to recommend that such time be used for relaxation and general digestion of material. They should also have time to indulge in some cultural pursuits —"without a sense of guilt."

One participant noted that additional free time might be obtained in an already crowded curriculum by rigorously pruning material presented for complete coverage. A pathologist stated in this connection that he is now using only one-third as many microscopic slides as formerly.

It was emphasized in some groups that, if free time were to be made available, it should be done at the administration level so that "greedy" departments did not make use of it.

The use of electives promoted considerable argument. Their value was granted because of their motivating force and relationship to the development of individuality and scientific curiosity. However, it was felt by many that the sophomore year might be too early for exposure to such methods, in view of the bulk of necessary data to be acquired.

It was thought that in any university atmosphere some unscheduled time for the student is desirable. It may be utilized in a number of ways: (a) as a break in a stringent routine, (b) as an opportunity to develop personal interests and (c) in special studies in investigative fields. Elective courses were considered of value if they were truly elective, and not related to courses presently under study.

Delegates from Western Reserve University described the success of their program of high-percentage free time. Two or more days per week are allowed. The students, they reported, were conscientious in using it to further scholastic and research efforts. The opinion was expressed by others that such amounts of unscheduled time made for a less relaxed student,

because of the self-discipline involved, than programs in which nonacademic use of free time was anticipated. However, participants from Yale, where a great deal of responsibility is left to the students as to scheduling use of time, as well as Western Reserve, insisted that "although one started with unhappy freshmen, they ended up much happier graduates." It was apparent from much discussion that a hard-working, relaxed, well-motivated student was the ideal of all teachers. No matter how attained, it was desirable to strive for an atmosphere that engendered some pressure but not too much.

Summer vacations. There was wide variation in opinion about the best utilization of the summer vacation period. Most discussants agreed that they should be kept free of assigned routine course work and devoted to individual projects and broadening experiences. Such projects might well be stimulated, sponsored and sometimes financed by the medical school in the form of fellowships. The value of fellowships as motivation for the gifted student was underscored. A need was expressed for the exchange of information on vacation experiences and projects. It was suggested that this might be set up through the offices of assistant deans, with the Association of American Medical Colleges functioning as a clearing house.

It is unusual nowadays for the summer to be spent in some leisurely or recreational activity. Examples were mentioned of schools in which vacation periods were being curtailed.

Although many felt that the way in which a summer might be used should be left to the discretion of the student, it was apparent that teachers as a whole put a high premium on the varieties of experience available during the summer. Chief values to be derived were: (a) an opportunity for broader personal contact (students should be urged to take jobs in which the index of contacts was high); (b) time to relax free of the pressures of medical school activities; (c) interesting research projects and (d) clinical clerkships or preceptorships with doctors in private practice.

Earning money during the summer was recognized as an important aspect of vacation work. As disclosed by the questionnaire, among sophomores and seniors polled the average amount saved from summer jobs was around $400.

Canadian schools and some American schools have relatively long summer vacations which enable students to work and earn money. The majority of the discussants seemed to favor long vacations. As one said, "Every curriculum committee meeting should result in fewer rather than more curriculum hours." Obviously the evaluation of summer vacation was correlated with a teacher's attitude toward free time in general.

Preparation of students for medical school

This provocative topic aroused considerable interest among the teachers present at the Institute. The conclusion was that there was room for extensive re-evaluation of the role of the undergraduate college in premedical education, and re-assessment of medical requirements. In several groups members came up with the suggestion that there be a Teaching Institute devoted to this area, at which delegates from medical schools could sit

down with representatives from the liberal arts colleges from which their students came.

The need for improved liaison between the schools was urgently emphasized. Tradition seemed to be the major hurdle in achieving more continuity between their programs. Chief points around which a desire for change revolved were: (a) need for marked improvement in premedical advisers; (b) re-evaluation of the liberal arts curriculum with a view to eliminating some requirements of limited value and (c) more premedical emphasis on speaking and writing good English.

Liberal arts versus science. The groups expressed deep concern over undue emphasis on the sciences in the premedical course, and believed a better balance between the sciences and the humanities might be struck. This trend was illustrated by certain schools which have eliminated the term "premedical" from the curriculum.

A liberal arts college gives the student an opportunity to take a broad variety of cultural subjects and he should do so. "Good counseling programs in the first college year are important to prevent the neglect of nonscientific subjects by those who genuinely wish to pursue them." There would be plenty of time in medical school to concentrate on the scientific fields.

Students on the questionnaire had expressed some regret over not having had more courses in the humanities while in college. Some teachers were inclined to belittle this reaction. Among comments heard were: "The stated desire for humanities is largely of the lip-service variety." "How broad can a man be?" "There is no serious lack of cultural attainment. Complaints from students that they missed broadening experiences by not taking more courses in the humanities and social sciences may be based on a misconception of what these courses have to offer."

One participant warned against the danger of categorizing scientific studies as "uncultured" and pointed out that understanding of the physical and biological sciences is as much a part of our cultural heritage as other aspects of human learning.

One member made the point that subtle influences at every stage of training affect the cultural development of the medical student. The importance of general education should be a matter of example to students in all courses of medical school study.

Improvement in verbal skills needed. A strong unanimity of opinion emerged on the matter of communication skills. Students are frequently handicapped by an inability to speak and write good English. In one school described, students were sent to the English department of their college for summer courses in spelling and writing.

Students should be made to recognize that in the learned professions society compensates a man not merely for what he knows but for his ability to communicate that knowledge to others. A would-be physician needs to be able to express himself clearly and well, not only for cultural reasons but also for most practical ones. As a physician on a "team" he is in a position to give orders that must be followed by others. He is dealing with

fallible human beings who may not understand and act on instructions; his ability to communicate in an effective way becomes a professional essential.

Selection of students

It was pointed out by one of the members of the Institute that the selection of students for admission to medical school in many ways parallels the selection of personnel for other kinds of positions. Perhaps modern personnel methods of proven effectiveness might be employed in determining who should be accepted for medical training. One participant cited a case in which a graduate student of unusual intellectual capacity, as indicated by his scholastic record and performance in the laboratory as well as impression made on faculty members, proved to have personality problems which resulted in his failure to complete independent investigative work. This defect was so serious that after three years of graduate work the student was dropped. He subsequently sought employment elsewhere and took an examination for prospective salesmen given by a commercial firm. The report showed up essentially the same information gathered by the faculty over a period of three years in evaluating him—his intelligence, his exceptional capacity in certain areas, his serious defects in others. It was suggested that the personnel test effective in evaluating this student would also be effective in the selection of medical students and would aid in eliminating some who proved to be problems. Those who discussed the matter felt that they did not know enough about modern personnel tests to judge their applicability in this regard. No recommendations were made as to the methods of personality evaluation of a prospective student, other than the traditional interview—which it was agreed left much to be desired.

Student opinion polls

The reaction of Institute participants was divided as to the value of student opinion polls as a guide to improving teaching. Some had never regarded student opinion of sufficient significance to seek it. Others had not found it helpful. It appeared not to be a popular device for measuring pedagogic effectiveness.

There were those, however, who had utilized student evaluations effectively. One group formulated some qualifications that should be kept in mind in utilizing student polls: (a) the student needs assistance with criteria prior to making judgment; (b) student organizations should screen "gripes" prior to presentation; (c) there should be no faculty recrimination against students; (d) students are better judges of methods than objectives and (e) students' judgments improve as they mature.

It became evident that a variety of techniques had been used successfully in obtaining student evaluation, that had led to improvements. In one school, senior student officers evaluate the instruction they have received throughout the four years. They consult with classmates to a varying degree and eliminate harsh comments before turning the report in to the

faculty. In this case their estimates were highly valued by the teaching staff, who felt them generally "fair" and representative of student opinion.

In another school, clerical personnel and a specially trained executive assistant evaluate student opinion on a teacher's request. The students are given questionnaires at the end of the teacher's lecture in which they are asked to comment on the favorable or successful aspects of his teaching as well as criticize weaknesses. The questionnaires are tabulated, the original record is destroyed and the report is sent to the individual faculty member and no one else. This questionnaire is devised so that the student compares the teacher with five other faculty members who represent the whole spectrum of competence. He thus knows what his standing is on specific criteria.

Some members of the Institute were much against this sort of interstaff comparisons. (Similar strong feelings were manifested when one participant stated that at his school all teachers were required to attend instructor's lectures and criticize them "for his improvement.")

Two schools submitted examples of unsatisfactory results from student polls. In one case only students of critical attitude submitted their comments, which were unduly harsh. In another case the results were summarized and mimeographed for distribution among students and faculty.

Student opinion could, of course, be sampled in various ways—not only by formal questionnaires but through social contacts, by visits to homes of teachers, and through small group consultation, where feasible.

Value was also placed on the opinions of graduate students and even practicing physicians, who many times were thought better judges of student problems than the young men actually involved in the experience. It was suggested that these groups be polled in any serious effort to assess the effectiveness and success of an educational program.

The practicing physician

Recurring frequently throughout discussions at the Institute was the question of how methods for appraisal of the final product of medical school, the practicing physician, might be developed. For this there seems to be at present no adequate gauge. Whether any kind of profitable study might be made measuring the quality of doctors and its relationship to the kind of preparation given them was speculative. It was urged that thought be given to exploring this possibility, which would give the most unequivocal criteria by which a medical school might be judged.

VI. The Teacher

NO SESSION of the Teaching Institute aroused more thoughtful and spirited assessment than that devoted to the problems of the teacher. Here was an opportunity to dissect the prototype of the good teacher, his attributes and his responsibilities, the problems of recruiting him and the environment, actual and ideal, in which he functioned.

The representatives of the schools attending the Institute were sharply reminded of the all-inclusive requisites of their profession. The injunction, "Go thou and do likewise," was not literally invoked. The suggested criteria of a good teacher, however, were flashed across their minds as a measuring rod in appraising potential candidates for a teaching position, in estimating colleagues and, in cases of extreme objectivity, for self-assessment.

Had the representatives felt they should model themselves upon the hypothetical composite man personified in the ideal teacher, they might have well left the Institute in a state of absorbed confusion. His attributes were so varied and all-encompassing that many seemed mutually exclusive. A variety of traits is required of medical men; those who are also teachers need a broader diversity.

The good teacher

It was, for instance, suggested that a good teacher should be able to captivate and inspire his students by having a dynamic personality and a sense of showmanship; at the same time he must not dominate. He must impress the student with the profundity of his knowledge, yet have intellectual honesty and humility. He should present subject matter clearly and understandably but encourage the student to acquire knowledge by his own effort rather than through the teacher.

It was hazarded that medical school appointments were frequently made without consideration of many of the attributes emphasized at the Institute. The hope was expressed that these criteria be kept in mind as much as possible in future appointments, within the limitations of availability.

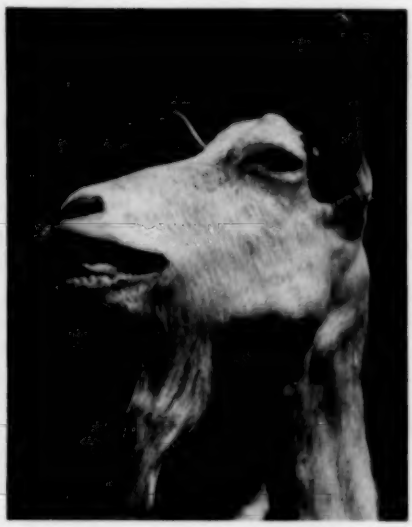
Teaching staffs can frequently achieve the versatility that no single individual possesses. The more teachers who have a cross section of desired qualities, the better the staff. The more who innately possess them, the better the teachers. Any one who has even a few of the desirable attributes is probably a good teacher.

Attributes. Essentials are: knowledge of the field, and ability to stimu-

Hoit, from Cushing.

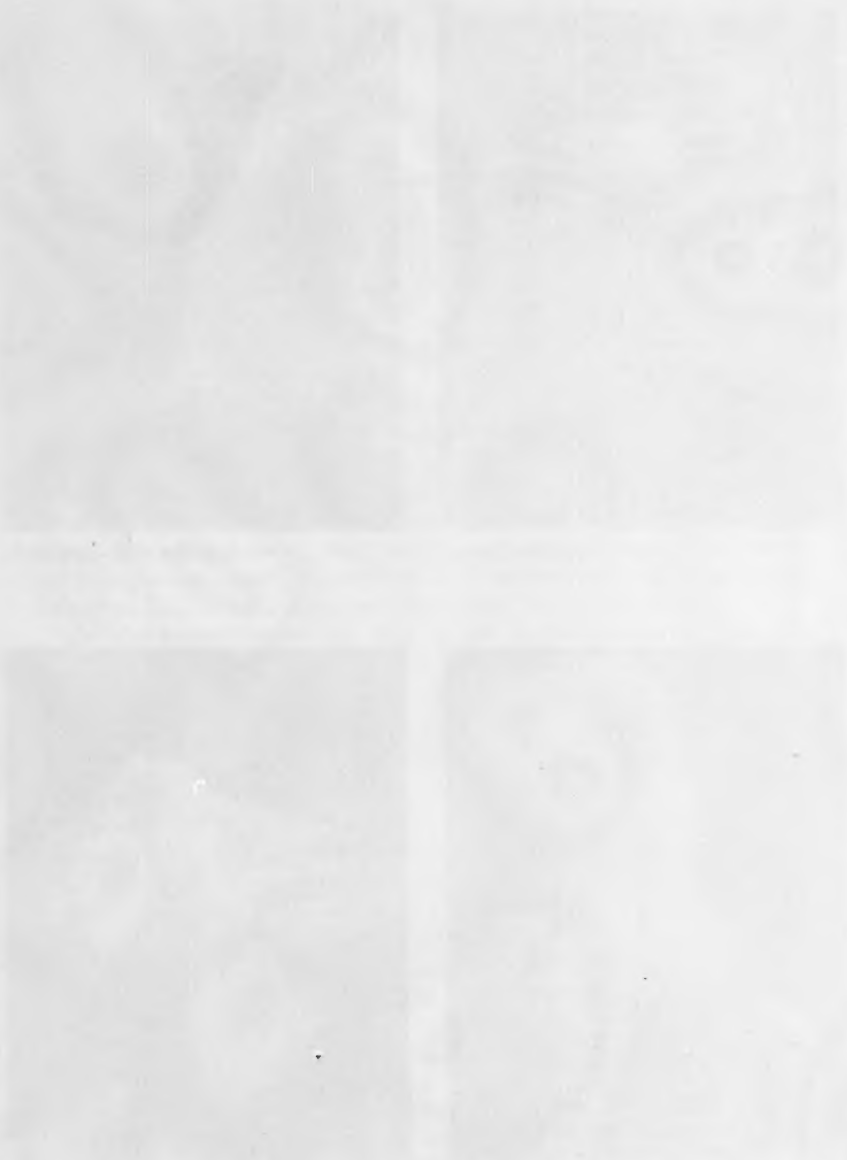
Ylla, from Rapho-Guillumette.

Ylla, from Rapho-Guillumette.



Ylla, from Rapho-Guillumette.

PLATE 2. These pictures were shown at the general session on the day devoted to problems of the teacher, to illustrate some types of teachers.



late and to develop intellectual curiosity in the student. The knowledge must have been sifted out with a good deal of critical acumen. Research contributes to continued growth, and in pathology evaluation of disease in the clinical laboratory is needed. A teacher must foster the development of knowledge by maintaining a persistent curiosity.

The second attribute is important because students must learn to think for themselves. It was agreed that one cannot "teach" students much; ultimately they can only teach themselves.

A good teacher has an interest in people. His influence is effective in generating a sense of motivation in the student, and sympathetic awareness of individual problems is important. The best teachers, however, are not always the most popular. Students may resent for a time a provocative teacher who drives them into outdoing themselves. A teacher who is best for one student may not be best for other students in the same class.

A quality of the good teacher is the capacity to utilize fully his imagination, trained and inherent, in devising teaching techniques and presenting ideas. As one participant stated, "Imagination is the ability to regroup ideas into new or unusual patterns and to realize the implication of the new arrangement." Logic *per se* might be a handicap rather than an aid in this process.

Among other desirable qualities of a good teacher are spiritual values which will inspire his students to carry into medical practice a sense of ethics, reverence for life and community responsibility. It was suggested that this last was too rarely present in modern teachers, especially in the preclinical sciences.

The medical teacher who lectures regularly has additional requirements. Besides full knowledge of his subject, he must gear his presentation to the level of his audience, present it clearly and have some gift of forensics.

However, not every teacher need be a top-flight lecturer. Those outstanding in certain techniques should be used accordingly, whether in lectures, laboratory or group discussion. Laboratory teaching was "a man's job" and should not be relegated to junior department members but might frequently be handled by the department chairman. Group discussion was an area to be delegated to those with most ability to "draw students out" and not simply talk to them.

There are, it was noted, no known genetic factors responsible for a good teacher. Occasionally a brilliant pedagog is born; the majority however can learn the techniques of good teaching if properly motivated.

Difficulty of assessment. How to measure the attributes of a good teacher was more difficult than to state them. This was repeatedly underscored as a serious weakness in personnel selection. The teachers present were not familiar with any gauge by which to assess such qualities in a staff candidate beyond personal evaluation. Furthermore, even after continued association it was found difficult to measure specific teaching strengths and weaknesses. (For further comments on personnel evaluation see page 31)

Some faculties made a practice of sitting in on lectures in order to be better able to correlate course teaching, as well as offer profitable sugges-

tions for improvement of staff lecturers. To some discussants this represented a most objectionable procedure.

Aid from professional educators recommended. A wariness against the involvement of professional educators in medical school problems was expressed by some members of the Institute. Others suggested that personnel assessments, teaching techniques and curricular evaluations might be considerably implemented by consulting educational experts from outside the medical field. Teachers should, however, be free to favor adoption or rejection of suggested methods. If an outside expert came in to survey a department, he should survey not the technical activities of the laboratory, but utilization of material, teaching methods, etc. It was admitted that an outside man would have considerable difficulty in judging techniques which would vary from undergraduate school to medical school. Several discussion groups, however, recommended some such procedure. In general, the reaction of the Institute participants was expressed in the words of one who said: "No one wants to conform entirely to the opinion of experts. Some suggestions on methods would be useful."

Teaching versus research

Research activities are essential to the growth of the science of medicine, and the purpose of a university, it was recognized, was to advance knowledge, not merely disseminate it. Some participants felt, however, that overemphasis had been given research in recent years, to the detriment of good teaching.

The dichotomy in personality between the "research" type and the "teaching" type, both of whom are frequently combined in one person in medical schools, appeared as a source of concern. Whereas intellectual qualities may converge, communication skills often differ, and practical compromises must occasionally be made.

The dual role played by one individual who must be both researcher and teacher is a difficult one. The gifted researcher, by the very nature of his bent, has personality traits at variance with those of a skilful teacher. One participant expressed it this way: "The depersonalization of research that results from emphasis on the study of tiny fragments excludes the view of the total organism. As a teacher a researcher is less likely to be interested in human beings and their interrelationships, so essential for a teacher, and correspondingly unaware of the student and his problems. Such a loss of perspective will affect his students' development and take a toll on the idealism with which most of them entered medical school."

The growing emphasis today on research—influenced to some extent by the availabilities of funds in this field—should not be allowed to overshadow the importance of the art of teaching, either in staff selection or in the attitude of the researcher-teacher. Too frequently, some thought, teaching duties get the scant end of prestige, interest and energies. Most discussants at the Institute were outspokenly insistent that attention be given to putting genuine teaching abilities above other qualifications in making faculty appointments. The lack of specific criteria for judging creative skills in

teaching remained an unsolved problem. It is easier to show concrete achievements in research.

Advantages of research. Although a man brilliant in the research field is frequently not the best teacher, nor the best teacher always endowed with a flair for research, consensus was that a proper balance of research and teaching was important to both. A research project keeps a teacher abreast of current developments and helps him sustain an attitude of active intellectual curiosity. Though research may detract from concern with teaching, this may sometimes be counterbalanced by an increased staff for his department. Also, not the least of its advantages is the increased salary and prestige made available to him simply because research enjoys a high priority in outside support.

Research activities are not only essential to the growth of the science of medicine; they also influence the advancement of younger individuals because of the stress placed on them in evaluating progression in these fields. One group stated: "We are opposed to the principle that research is necessary for promotion, but this seems to be fairly ingrained in academic departments today and may be difficult to eradicate." Others disputed this conclusion, pointing out that promotions did occur without broad research experience.

One participant emphasized the indispensability of research funds to make life worthwhile for the man who is teaching, particularly in a small medical school. "In general," he commented, "teachers find that their standing in the community is lower than they think it should be; and the fact that they are doing research is an important source of respect from a community which may look upon them as men lacking qualifications for practice."

Some pathologists pointed out that, before recruiting men into pathology, for example, it is necessary to assure them that they will have sufficient time away from teaching to do their own work.

The comment was made that a balance between teaching duties and research would only be achieved when funds were procured to equalize teaching and research loads. As cogently expressed by one participant, "It would be nice to have money to hire both types for an academic department. It would be good also to have funds to employ individuals who might be able to perform service duties as well."

Service functions

The conscientious teacher frequently finds himself beset by multitudinous demands beside research and teaching—administrative responsibilities, committee functions, scientific meetings, maintenance of proper relationships as a member of his community, public relations and service functions in conjunction with patient problems.

A tendency to give service functions priority because of a sense of responsibility to the patient and the urgency of such demands was seriously questioned. One participant strongly urged that the only way in which disciplines such as microbiology and biochemistry could continue to perform

their mission of advancing knowledge was through maintaining complete freedom from service responsibilities. Others were inclined to believe that some service responsibility is desirable and stimulating and helps make a better teacher. They reminded their colleagues that students are impressed when microbiologists and pathologists participate directly in the diagnosis and care of hospital patients. This gives these sciences an aura of practicality and value which increases their prestige with the student. The proponents of increased clinical functions for the microbiologists specified, however, that diagnostic work should be in the nature of consultation, and not direct responsibility for handling cultures or performing routine procedures.

In contrast to the relatively small clinical contact of the microbiologist, service demands made on pathologists were described as so burdensome that, in the words of one participant, "They seriously threaten pathology today." It was generally agreed that pathology departments perform a much greater service function than necessary to orient themselves to the teaching of medicine.

In contrast to the factual reports required of microbiology departments, pathologists must frequently make time-consuming reports based on interpretation.

One participant called the attention of his colleagues to significant data culled by the questionnaire in this regard. Among the departments of pathology that responded, more than 80 per cent had service duties for autopsies and surgical pathology, nearly two-thirds conducted a service in exfoliative cytology and about 40 per cent had responsibility for aspects of clinical pathology, including microbiology, serology, clinical chemistry, hematology and blood bank. The routine service load was described as "massive" and "staggering." The average number of autopsies per year reported by departments with an autopsy service was 836; the average number of surgical specimens was 12,926 in a year, and the average annual specimens in exfoliative cytology numbered 6,507.

Nearly half of this material, it was noted, came from "outside" institutions other than the immediate teaching hospital with which, it was conceded, the department has an unavoidable relationship.

A faculty member who discussed service demands at length was of the opinion that sufficient material for teaching pathological anatomy could be provided by 300 to 600 autopsies and 3,000 to 6,000 surgical specimens a year, "easily available from one good-sized hospital." He cautioned against departments reaching out for, or allowing themselves to be saddled with, responsibility for autopsies and surgical pathology in hospitals outside their orbit and in a volume that exceeds what is necessary.

Remedies proposed against overburdensome service emphasis included: (a) salaries high enough to obviate the necessity of supplementation from outside sources and (b) staffs large enough to provide adequate services on a rotation basis, with periods of freedom from routine that can be devoted to teaching and research.

Just where a balance lay in regard to service, teaching and research was not determined. Some participants thought that the time should be divided

equally among responsibilities for all three. Some felt that the younger members of a department should spend as much as half their time in research. Others expressed the opinion that the primary objective of a medical school is to impart knowledge and, while investigation and service are desirable for the life of the school and medicine, the teaching effort should have priority.

Less dissatisfaction with the relative amount of time spent on service duties was apparent in the questionnaire sent to medical schools than in the discussions at the Institute.

Committee assignments. Much discussion centered around the diversion from teaching and research that may come from excessive committee assignments. It was felt that younger men, as well as the older professors, should have a certain amount of committee work in order to make them feel a part of the inner workings of the medical school. But general administrators should reduce committee meetings to a minimum and should not ask faculty committees to deal with strictly administrative questions. Many felt that all faculty members should sit in on admission committees.

Departmental relationships

Attention was given the relation between senior and junior members of a department. It was popularly held that departments are best run on a democratic basis, with younger men being given administrative responsibility as well as encouraged to comment on matters of policy. However, some believed that senior staff members should assume all major responsibility. In some schools, senior members briefed junior staff members before they took over a class. In some cases teachers made a point of sitting in on their colleagues' lectures to assess their teaching skills.

In many cases it was thought that students profited more from contact with senior faculty members than with younger ones, and the former were urged to maintain as close relationships as possible with the students.

A problem raised in some groups was whether there should be a formal table of organization for department personnel. The majority opposed a rigid "slot system" in which everyone was assigned a specific position, and preferred a flexible system of organization.

Promotions

Rigid rules concerning promotions were not recommended. That a man should serve a given number of years, be of a certain age, or have special assets such as board accreditation in order to assume an important staff position was not endorsed.

The problem of promotions without increase in pay was discussed and criticized in one group as a subterfuge that was undesirable although occasionally necessary. A man's reasonable ambition to become chief of a department, "which is natural and understandable," should not be unduly discouraged or scorned.

Specialization

Several participants thought that using a person with a narrow interest in a particular field leads to imbalance in presentation of subject matter and a lack of broad coverage of basic principles. Others indicated that it is the function of the department head to keep his course in balance. If there is a doubt, as one participant suggested, "It is better to err by teaching too much than too little."

It was agreed that many good teachers may do research in a very narrow field, yet have the broad interest essential to successful teaching. Some departments which have become centralized in research interests over the years have remained good teaching centers because staff members have maintained this broad background. As one pathologist said, "It is bad to be narrow in one's interests, but not in one's training." An individual with narrow training and narrower interests would obviously not make a desirable member of a medical faculty.

Broader training in both scientific disciplines and humanities was urged by some, who recommended survey courses to counterbalance overspecialization, followed by detailed courses in other specialties. The survey course would be given by the generally trained man; the detailed lectures by those who were experts in the respective specialties.

Recruitment

The recruitment of competent personnel in the teaching disciplines represented at the Institute was a topic of extended discussion. It was obvious that this stood high among faculty concerns.

A healthy recruitment rate is important in maintaining high professional standards in any field. The traits and training required for academic work automatically restrict the quantity of candidates available. This increases the importance of a continued effort to attract promising students into teaching. There were many proposals as to how this could be achieved. Equally important in maintaining an adequate supply is holding on to those already recruited—sometimes difficult in view of the persuasive blandishments of clinical practice. Ways to do this were also explored.

One faculty member questioned whether a shortage of pathology teachers actually existed, as it appeared to him that most departments were filled. It was pointed out that "there was always room for a good man." As one pathologist said, "Schools that want additional teachers are numerous. Schools that should want additional teachers are more numerous."

It was particularly evident that teachers trained in medical genetics are sufficient to staff only a small fraction of the medical schools. According to the questionnaire, there was a maximum indicated need for two additional full-time teachers for each department. With the present average number of five per department in microbiology and pathology, this would entail a 40 per cent increase in medical teachers.

If, as shown by survey, only one per cent of the graduates of medical schools go into teaching, increasing this to a mere two per cent would double the supply of teachers.

Desire for such an extensive increase in the numbers of would-be pathologists and microbiologists was not apparent in the discussion.

Suggested recruitment aids: (1) Reach students early. Opinion was that students could be influenced on their choice of career at any time in their schooling: during high school and premedical years as well as in medical school. As a first step, pathologists and microbiologists should endeavor to reach students early through vocational counseling programs in local high schools and colleges. It is at this stage that many potential medical school students are drawn off into the study of physics and other nonbiological sciences. Capturing the imagination of young people with the meaningful and challenging endeavors open to them in the biological sciences was considered of great importance.

A suggestion was posed that medical school admissions committees take advantage of their role in determining who was to be accepted, and make a point of procuring some young men with conspicuous research interests, " . . . at least enough of these so as to draw in a sprinkling with each class."

(2) Better public relations. It was recommended that more use should be made of the techniques of public relations. An effective public relations program, for instance, could inject information on careers in microbiology and pathology into vocational guidance programs throughout the country.

More adequate news coverage of material emerging from these fields would also be helpful. Rich resource material could be found in pathology for science shows similar to those currently popular on television. Much, it was agreed, could be done to better acquaint the public with the activities and contribution of these professions. "But somehow, pathologists must increase their ability to communicate."

(3) Develop appreciation of a discipline. It was the consensus that more could be done than at present to influence the medical student in his choice of career. Opinion varied as to the amount of proselyting that might reasonably be done. Some felt that, under the circumstances, professional duty required them to do what they could to "make a few more teachers instead of doctors."

Because the subject under discussion was recruitment of teachers, a natural emphasis on training teachers and investigators was apparent. The discussants were at times drawn up sharply by some of their colleagues who reminded them that, after all, it was the physicians who were primarily being trained, not researchers or teachers. "Both of the latter groups should be aimed at but not as an exclusive obligation." At such points hearty agreement was achieved on this basic premise—of course, "this was always assumed."

More familiarity with the basic sciences than exists at present might help lead students into academic careers. At present they seldom get a comprehensive view of what the pathologist does. Unlike the doctor and surgeon, in whose steps the students follow so closely, the pathologist is never seen on his rounds. His diagnostic work, for instance, is completely outside students' experience.

More personalized teaching in preclinical years, facilitated by having

larger staffs available, might help to attract students. As it is today, after a rather impersonal two years of lecture and laboratory the students are plummeted into the extremely personal atmosphere of clinical training which throws the formalized curriculum of earlier years into sharp—and unfavorable—contrast. It is natural that they tend to lean toward the clinical fields where they have had more personal attention.

The timing factor, it was noted, was responsible too for some of the competitive inroads of the clinician. If, as is frequently the case, all contact is lost with the preclinical sciences during final medical training, fewer students will be persuaded to return to them as teachers.

Many approaches to these and other aspects of this problem were suggested: (a) staff enlargements to permit continuation of teaching activities of the department through the clinical years; (b) close personal contact between students and teaching staff at all levels, including that of the resident or young instructor; (c) use of student preceptorships for laboratory service, teaching and research; (d) use of assistant residents at end of second year; (e) having the student stop at the end of the second year for a year of indoctrination in the basic sciences; (f) during the third and fourth years, draw the students back into the laboratory as clerks or research assistants; (g) offer early teaching opportunities; (h) encourage good training programs which equip students for teaching and research and (i) afford more research opportunities in the second year.

Other factors

Scholarships and grants. Scholarships and grants available for work in the specialties were of obvious importance in aiding recruitment. Particularly effective might be monies to cover living expenses while doing graduate work in preparation for teaching. (For more comment on this from the student point of view, see page 53) Teaching fellowships from philanthropic foundations could do much to encourage medical students, struggling with the dilemma of choice of career, to go into teaching.

Personality of the teacher influential. Discussion invariably returned to the personality of the teacher. His ability to idealize the profession for students, his capacity to win their deep admiration—in short, his ability to inspire—was the single factor remembered by most participants at the Institute as having affected their choice of a teaching career.

Increase the attractions of teaching. The medical teaching profession is peculiarly exposed and vulnerable to "raids." Having put in the same stint of time and effort, and equivalently trained, those who have chosen academic careers may be understandably seduced into higher paying clinical work if other factors in teaching do not compensate.

It was felt that many departments could reduce their heavy service and administrative loads and enlarge opportunities for independent research. Also "all microbiologists and pathologists recruiting for their specialties should recognize as a prime assumption their responsibility to provide adequate research and academic facilities."

Junior teachers with an active desire to teach should be given oppor-

tunity to do so since prolonged frustration can dampen their enthusiasm.

Attractions of research disputed. The feeling was repeatedly expressed at the Institute that interest in and opportunity for research attracts students to teaching. A poll of opinion among senior students, however (see questionnaire results), indicated very little interest in research, in contrast to much interest in teaching. The high interest in teaching, however, was contingent upon an opportunity to combine it with private practice on a part-time basis. Also, whereas interest in teaching seemed to increase the longer the student was in medical school, the low interest in research expressed by sophomores decreased still further thereafter.

Some participants disputed the contention that more research opportunities would lure medical students into teaching. They pointed out that medical students are not much interested in research. The majority of students inclined toward research never reach medical school but are diverted long before. And, though the staff might indeed strive to motivate research, it was more likely that academic choice would depend upon the attractions inherent in the teaching role. Therefore, they should seek more student scholarships and fellowships for teaching as well as research; highlight all that pathologists and microbiologists do; develop closer student-teacher relationships; permit basic science men to teach in clinical years; and generally "make the lot of the teacher in these departments such that at least it does not invoke pity."

The satisfactions of teaching, as this contingent expressed it, were more likely than research to lure students into academic life. As such they should be "fortified" as much as possible.

Salaries

The inadequate monetary rewards of teaching were stressed as a vital factor in explaining the attrition of existing faculties, as well as the failure to recruit an adequate new supply of teaching personnel. There was no insistence that salary levels equal to the incomes of private practice were either desirable or necessary. The upping of salary levels was aimed at relief from financial stress rather than at wealth. Estimates of adequate pay levels varied. As one participant phrased it, "Teachers' salaries should be increased to a point where chronic financial embarrassment is not an integral part of academic life."

It was agreed that high pay would not necessarily bring a man into the academic field, but that there is a minimum salary, the range of which was not set, which is critical to keep from driving him from the field.

Student opinion according to the questionnaire put less emphasis on low salaries as a deterrent from teaching than did teachers themselves. One microbiologist whimsically stated, "possibly because the detached spectator can afford to be impractical."

Microbiologists, it was agreed, suffered more severely from inadequate salaries than did pathologists—and had less opportunity to supplement them from the outside. Service work might be made available on a wider basis to

members of this discipline who desired it.

The principle of supplying financial support for sabbaticals was recommended, since lack of funds may hamper an individual on sabbatical and, indeed, make it impossible for him to afford to take such a year.

One participant made the point that, since state legislatures tend to vote increased monies for medical education because there are too few doctors, they might also be influenced by the knowledge that there are too few "teachers of doctors." Plans for action in this area were not developed.

In contrast to many who thought that outside grants or service duties should be relied upon to supplement salaries, the opinion was expressed by some that support from outside sources was not appropriate. "Medical schools should pay adequate salaries; continued supplementation will in a few years detract from effective teaching." Ideally, many felt, there should be no distinction between clinical and preclinical salaries. It was noted that one university had recently raised the salaries of all department heads, including that of anatomy, to $25,000 a year. On the other hand, some faculty members thought a differential pay scale between various disciplines was to be expected and should exist.

The discrepancies between the salaries of teaching Ph.D.'s and M.D.'s was mentioned. It was pointed out that the fact that pathologists are paid more has been salubrious in raising the salaries of the "nonmedical" men. The place of the Ph.D. in pathology was discussed. There was agreement that a broad biological background is required for the ideal instruction of medical students. Although a Ph.D. might contribute much to a department, it was for him a restricted career. He should be given freedom for research, as desired; care should be exercised that he not become "the servant of a Roman master," as was felt frequently was the case.

One participant suggested that the Teaching Institute make a study of the type of individuals who go into academic work, in order to facilitate earlier assessment of likely candidates.

Influence of outside agencies on teaching

Those who control funds for a medical school exercise on it powerful influence—whether as individuals, agencies or legislative bodies. The discussants at the Institute underscored the importance of proper communication between medical faculties and these groups and recommended that effort be devoted to establishing more effective liaison. For example, state legislatures have been known to force medical schools to increase enrollment beyond a point which the staff and facilities could competently handle. Legislative relationships are of priority importance for tax-supported institutions and should be carefully cultivated.

Government research grants. Those who fear socialized medicine are to some degree wary of the activities of the Federal government which relate to the support of medical schools through teaching and research grants. In the discussions at the Institute, however, the grant programs of the National Institutes of Health, the National Science Foundation and the Armed Services were generally lauded as models for the private fund-

granting agencies. Dissatisfaction with their restrictions was expressed by several—they provide support on the basis of a project rather than an individual; they require all-too-frequent progress reports; and the limitations on the duration of the grant are frequently too stringent. Others pointed out that much has been done in recent years to make such restrictions more flexible.

It was commonly thought not desirable to have large segments of the teaching staffs supported by government grants; preferably the nucleus of the staffs should be university supported.

It was suggested that the existence of a small amount of fluid funds which did not have to be spent within a certain period of time was of immense value to a faculty in that it afforded a teacher a sense of security in committing himself to a program over a longer period of time. One member described a dean's fund at Harvard which is used to underwrite investigations supported by short-term grants.

Competition of government institutions. A real hurdle for medical schools is the competition of research institutions, private and government, which are attracting personnel who might otherwise be engaged in teaching. Several representatives pointed out that it was increasingly difficult to attract both teaching and research personnel to a small medical school when a nearby medical research institute offered considerably higher salaries. This competition with government laboratories extends even to medical technologists.

One participant suggested that a review of salaries paid by medical schools might be helpful. "Was the technologist hired away by the government institute worth more than she was being paid by the college?" This problem was not resolved.

Accrediting and licensing agencies

Many teachers expressed the opinion that accrediting agencies such as state boards, national boards and specialty boards have not had any undesirable influence on medical education. However, there was strong dissent from others who insisted that state boards of medical licensure represented outmoded institutions and should be abandoned or drastically revised. Rigid rules, arbitrary actions and out-of-date examinations have set a pattern not geared to current needs. It was pointed out that emphasis on sometimes irrelevant factual details encouraged student "cramming" in this area, with loss of attention to other fruitful learning endeavors. The pressure of state medical licensure examinations, arbitrary rules and actions dealing with rotating internships as a prerequisite for licensure, evils incident to certain types of temporary licensure and interference with licensure of certain personnel qualified for faculty appointments were deplored. It was suggested by some that graduation from Class A medical schools should be dependent only upon an examination at the national level, such as the National Board of Medical Examiners.

Some discussants criticized the objective type of examination now being given by the National Board as an extremely undesirable influence on

teaching. Others disagreed, pointing out that when properly prepared they could be an excellent teaching device.

Some benefits accrue from national examinations, it was noted, in that they help keep the departments aware of the extent of their teaching effectiveness and perhaps in a minor way contribute to the self-confidence of the students as they compare themselves with students from other schools.

Specialty boards. The need for stressing specialty boards was strongly deplored although their importance was recognized. In the words of one medical school representative, they are "a necessary nuisance."

Chief evil ascribed to them was that training programs tended to be shaped to meet board requirements, whereas teaching objectives should be quite different. The boards set up a minimum standard, but it was suggested that there are also qualitative differences in training for the specialty boards those men concerned with clinical medicine and those preparing for the academic field. Some potential teachers may be lost to the profession because they pointed their training toward board accreditation. There was a general desire that boards be de-emphasized in academic circles. One participant whimsically suggested that a Board of Academic Medicine be set up "to add to the confusion."

The recommendation of the American Medical Association that a man have a rotating internship before entering pathology was discussed by some groups and adversely criticized.

Academic atmosphere

The question was posed as to just what makes for an ideal academic atmosphere. One group described it as "a composite of an atmosphere of challenge, sympathetic cooperation in search for knowledge, an area for the leisurely exchange of ideas and of opportunity for deliberation without the press of mundane life."

Desirable as the cloistered and leisurely atmosphere suggested by this definition might be, it was agreed that such an ivory-tower atmosphere was not essential for the emergence of good teachers and good teaching. Furthermore it was unrealistic and impossible of achievement. A modicum of "leisure, challenge, cooperation and contemplation" would satisfy most. Effort should be exerted, however, to counteract a "trade-school emphasis" apparent when service responsibilities and administrative duties are allowed to inundate the teaching staff.

Conclusion

FOR ALMOST ALL of those attending, the Teaching Institute was something new. There were those who were wary of the concept behind it, who came with conspicuous conviction that the conference was a waste of money and time. Others expected to find in it little of practical pertinence to their schools.

Some dubiousness on the part of the participants was justifiable. Here were men of science without a buttress of scientific fact to rest against. The data were, disturbingly enough, chiefly subjective: opinions on objectives of teaching, culled from the faculty of medical schools; problems of teachers, probed by a questionnaire; concerns of students, polled by opinion. Subject matter included the exploration of techniques and modes of teaching, the pros and cons of new subjects in the curriculum, and the processes involved in a correlated curriculum, sketched by those who had tried them.

Ultimately, of course, the effectiveness of the Institute was dependent upon the scientific approach of those who took part in it and the extent of their ability to dissect and analyze the amorphous mass of fact, personality and method which comprises the total process of medical education.

It is difficult to describe precisely the outstanding accomplishments of the Teaching Institute. The theme of the importance of the spiritual and the transcendental aspects of teaching ran through all of its sessions.

The point was made on the first day that, while methods are important, the teacher is more so. An enthusiastic teacher is essential if any method is to be effective. As the chairman of the Institute paraphrased Paul: "Though I understand all mysteries and all knowledge and have not enthusiasm, I am become as sounding brass or a tinkling cymbal." The reverse, it was noted, is equally true—without valid methods enthusiasm becomes meaningless.

It soon became apparent that there was no one answer for good teaching. The general approach became one of inquiry into all methods and procedures, with the basic assumption that the underlying purpose of teaching is to endow a student with ideals and utilize his individual talents to utmost capacity.

There was exploration too of those dynamic qualities which distinguish the dynamic from the static and put vigor and meaning into a teaching process.

The opening day at the Institute was enlivened by frequent and strenuous arguments among the participants. Many of these centered to some extent on the question of whether microbiology and pathology should be taught as service functions or as pure science. In pathology, arguments revolved

around the autopsy versus the laboratory as a method of teaching. There were those who saw the autopsy as static and stressed instead animal experimentation. They were refuted by others who differed sharply. Laboratory experiments, they said, could be didactic and static; an autopsy conducted with competence became a dynamic exercise. It was recognized that whether teaching was dynamic or static depended upon the teacher and not the medium. Whether the student developed into a thoughtful scientist equipped to meet the problems of tomorrow depended more on the intangibles of the teacher than upon methods used.

If the Institute changed few predilections, it generated considerable soul-searching on the part of all participants. It did, in many instances, create an awareness of the possibilities inherent in another's point of view, and a realization of how quickly and with what treacherous ease one's own chosen methods may become "static." Although it is likely that most pathologists left the Institute more convinced than ever that their discipline does not merit this charge, they did take with them a new resolution to vitalize their teaching in every possible way. As one pathologist said: "We must return more and more to the dynamic concept of Cohnheim, who taught that every physiologic change has a morbid anatomical corollary."

More important than the provocative dissensions of the Institute was what was to many an appraisal of its major achievement: the reminder that what had seemed to be problems peculiar to the individual or the school were in fact shared by a majority of colleagues in many schools; the disclosure that here and there solutions were being applied and inroads made on common problems, which promised to alleviate many of one's own. A renewed inspiration, a sense of unity and kinship with dedicated minds and, as one participant expressed it, "a reaffirmation of faith in the teaching of medicine," were major rewards both for participants and those who had organized the Institute.

The full impact of the series of Teaching Institutes will be slow in becoming apparent. We believe, however, that they hold promise of bringing closer that renaissance in teaching which will restore teachers to a pre-eminent position in society.

Appendix 1

The Institute

The sessions of the Institute covered four-and-a-half days, from Monday morning, October 11, to Friday noon, October 15. The first day was designated for discussion of the objectives of teaching; the second, for the problems of the teacher; the third, for the problems of the student; and the fourth, for interrelationships among the various disciplines. The last half-day of the Institute was integrated with the beginning of the meetings of the Coordinators of Cancer Teaching.

Early in the conference planning, four subcommittees were formed and each assigned responsibility for a day of the Teaching Institute. The chairmen of these subcommittees and the chairman of the Institute comprised the Executive Committee.

In order to provide maximum opportunity at the Institute for free and informal discussion, with all participants taking an active part, it was necessary to limit attendance. Each of 95 medical schools in the U. S., Canada and the Philippines was represented by one teacher, either a pathologist, microbiologist or geneticist, nominated by the planning committees. A few other individuals were invited as representatives of special fields or interests. The total number of participants was 126.

The first objective of the Executive Committee was to find satisfactory methods for transmitting to the participants the purposes and potentials of the Institute. Comprehensive questionnaires were devised by the subcommittees which included questions pertinent to the four subject areas to be covered by the conference (see Appendix 2). The results of the questionnaire study were used by the subcommittees as basis for preparation of proposed discussion agenda for the respective sessions. Prior to the Institute an analysis of the questionnaires was sent to all participants and to the Coordinators of Cancer Teaching.

The official opening of the Institute was preceded by a meeting of the 72 chairmen and recorders, or "analysts," for the nine discussion groups to be held each day. At this session the chairman of the Institute gave an introductory address on the purposes of the Institute. Dr. Frank Fremont-Smith, medical director of the Macy Foundation, spoke on the practical problems of communication, as preface to the discussions which were to ensue.

After a brief general session each morning, the participants divided into nine discussion groups. Each group had a chairman and a recorder. It was decided that, for elasticity of discussion, each group should be composed of not more than 15 participants. Assignment to groups and the selection of chairmen and recorders were determined in advance by the committees. To bring fresh viewpoints into the groups while retaining continuity, two members of each group rotated each day. Agenda were identical for each discussion group on a given day, but the order of topics varied among groups.

Soundscribers[1] were made available to each group to record interesting discussions and summaries of the day's proceedings. The transcriptions were turned over to the subcommittee chairman of the day who utilized this material in preparing a master summary for presentation at the general session the following morning.

In the afternoon, following adjournment of the discussion groups, an informal social conference was held, at which the nine discussion group chairmen for one day met with the nine chairmen for the following day to discuss highlights of the various sessions.

In addition to the day-long discussion groups, two evening meetings were held. One of these, devoted to the discipline of genetics, featured an address by Dr. C. Nash Herndon of Bowman Gray School of Medicine on "Genetics in Medical Education." This was followed by a panel discussion, whose participants included Dr. James V. Neel, University of Michigan; Dr. Bernard D. Davis, New York University; Dr. Curt Stern, University of California at Berkeley; Dr. William C. Boyd, Boston University, and Dr. John B. Graham, University of North Carolina. At the other evening session

1. Soundscriber recording and transcribing equipment was supplied through the courtesy of the Soundscriber Corporation, New Haven, Conn.

Dr. Chester S. Keefer of Boston University spoke on "The Student, the Teacher and the Curriculum."

On the final morning the Coordinators of Cancer Teaching joined the participants of the Teaching Institute for a general session in which representatives of the disciplines of pathology, microbiology and genetics summarized the results of the Institute from the standpoint of their specialties. Dr. Israel Davidsohn, Chicago Medical School, presented the summary for pathology; Dr. R. G. E. Murray, University of Western Ontario, for microbiology, and Dr. Walter J. Burdette, Louisiana State University, for genetics. Subsequently, 12 discussion groups under the general chairmanship of Dr. Edwin A. Lawrence, Indiana University, and composed of Institute participants and cancer coordinators, dealt with topics pertinent to the field of cancer.

The Armed Forces Institute of Pathology presented an exhibit on malaria, and each afternoon there was a showing of selected teaching films by the AAMC Medical Audio-Visual Institute. The cooperation of these organizations in making the exhibits available to the participants of the Institute is gratefully acknowledged.

The Institute was made possible by generous financial assistance from several sources. Principal support came from the National Institutes of Health, U. S. Public Health Service, through a training grant from the National Heart Institute and a field investigation grant from the National Cancer Institute. The medical schools bore a large share of the expenses incurred by their participants. The Association of American Medical Colleges provided assistance in many ways, chiefly through the services of its staff.

Special thanks go to Mrs. Helen Morford, of the Association of American Medical Colleges, for her able assistance in the preparation for and functioning of the Institute; to Elizabeth Collamore, Margaret Anderson and Elizabeth Nelson, assistants to the chairman; and to J. Edwin Foster, director of the AAMC Medical Audio-Visual Institute, who prepared the charts.

This report of the proceedings of the second Teaching Institute was compiled by Lura Street Jackson, in close cooperation with the chairman, the four subcommittee chairmen and their committee members, and includes material drawn from all sessions of the Institute.

Appendix 2

Questionnaires

In planning for this Teaching Institute the four subcommittees prepared questionnaires for distribution to medical school participants. The four types of questionnaires and the number of responses received were: (1) a questionnaire for the participants (81 responses); (2) one for chairmen of departments of pathology and microbiology (158 responses); (3) one for all full-time faculty members in these departments with the rank of instructor or above (699 responses) and (4) one for sophomore and senior medical students, interns, residents and recent graduates (1,644 responses). This appendix gives the results of the data obtained from the questionnaires.

The Subcommittee on Problems of the Student asked that students, interns, residents and recent graduates be given an opportunity to express their ideas about their medical education. These groups welcomed the opportunity and appeared to express themselves freely. The results reported in this appendix will be of special interest. Each participant was asked to obtain a random sample of approximately 10 per cent of the sophomore and senior classes in his medical school. This was done by selecting from alphabetical lists every tenth name in the sophomore class and every tenth name in the senior class. When the questionnaires were completed, participants indicated the student's comparative rank in his present class as top, bottom or middle third. Participants were also asked to select in their school two interns, two residents and two recent graduates.

The subcommittees tried to make the questions provocative and to phrase them in such a manner that there could be only one interpretation. In the latter we were not too successful, and some of the data presented are open to doubt since the questions were interpreted in various ways. They were intended, however, for use by the subcommittees in preparation of agenda and as a basis for discussions at the Institute.

We have thought it wise to include in this appendix most of the data available. In the questionnaire for participants, the section on objectives called for essay-type answers which are not included in this appendix. These responses were evaluated and analyzed by members of the Subcommittee on the Objectives of Teaching for planning discussion topics for the first day of the Institute and were used in the preparation of this report.

The data in the tables were coded in various ways. Where there were little or no significant differences, for example between tax-supported and endowed institutions or in class standing, the information has been omitted. In some of the tables, however, the differences between groups were of statistical significance and were calculated by a Chi-square test, the results of which are indicated in a footnote.

All the information obtained from the questionnaires has been preserved in the office of the Association of American Medical Colleges and is available for further study.

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Special Topics

Responses from participants

Each medical school participant was invited to express opinions on any or all of five specific questions which had been raised by the committees. The questions and representative excerpts from the responses received are given below.

If courses should be reduced in length so that there would be more opportunity for elective subjects and for genetics during the first two years, what current courses should be eliminated or abbreviated?

I would recommend reduction of time given to embryology and biochemistry during the first year and have these subjects covered in the premedical course.

The courses now offered in microbiology are given a bare minimum of time and could not be further reduced without jeopardizing the program. It may be possible to save some time by close correlation between microbiology, pathology and epidemiology, especially if the course in epidemiology now offered in the second year could be taken out of the curriculum.

There seems to be a certain need for *free time*. This could be gained by having more coordination between the departments, thus avoiding unnecessary repetitions. However, concrete suggestions for reduction of courses cannot be made.

Bacteriology could reduce the formal course and leave time for elective courses as immunology, virology and chemotherapy. In the case of pathology rather an increase in length would be desirable than a shortening.

Under present conditions of teaching it is difficult to see how the basic science courses could be curtailed appreciably without doing more harm than good. Shortening most of the basic science courses, and rendering them more practical and clinically applicable, would probably result in the senior students appearing better prepared for practice, provided the time saved was used effectively for additional supervised clinical practice in the clinical years. I fear that this more mature appearance would be too much at the "medical corpsman" level of technology applicable to the medical practice of today. This appearance would be at the expense of the student's understanding and feeling for basic biologic science which will serve as truly professional background knowledge for his development into the medical practice of the next decade.

The basic science courses could be shortened somewhat without harm if more basic science participation in clinical teaching could be arranged. Much of the laboratory time spent, especially in microbiology, physiology, pharmacology and biochemistry, is not very effective in preparing the student for the work he will do on the hospital wards. Well-chosen demonstrations with visual aids could be substituted for much of the time-consuming laboratory exercises without reflecting seriously on the student's technical performance as an intern. On the other hand, I suspect that the laboratory experience contributes greatly to the rather intangible truly professional feeling for, and understanding of, biologic science which is the background for the student's capacity to become an effective lifelong student of medicine. Training on the job by using animated cartoon type illustrations of those basic principles which we know how to apply today has proved effective in purely vocational training, but leads to the production of skilled but uneducated technicians. This, I believe, is not what we want in medical education unless we are to adopt two levels, professional and vocational, of medical education. Most of us are not ready to accept this.

Certainly everyone would agree that if any courses are to be shortened to provide more time it should be the "other fellow's course." I would suggest abbreviating anatomy, although it was recently reduced 30 per cent.

The present course might be reduced in time without loss of effectiveness of teaching principles. The laboratory time of pathology, microbiology, anatomy and chemistry could be considerably shortened. The time gained might well be used for electives and genetics.

To permit genetics and other electives, I would curtail microbiology by omitting much of the details of cultural identification of organisms and much fine detail in immunohematology. Such details can be read in books as the need arises. I would eliminate some detail in anatomy. (What physician ever needs to know the exact

origin and insertion of most of the muscles excep the fracture specialist? And he learns them all over again in his residency.) I would omit some of the more archaic items in pharmacology. (But they are likely to be the first questions on state boards, so we must teach them. The same is true of some diseases in pathology, but they still are the object of state board and national board questions!)

By the above means I think 100 hours or more could be salvaged.

No courses should be totally eliminated.

The pathology department answered this question in the following manner. Discussion of this topic among the staff resulted in the following suggestions: That any gross cutting would probably involve an actual shift of some subject matter from the early years to the clinical years when they could perhaps be better appreciated. More specifically, it was felt that much gross anatomy, systemic pathology, microbiology, neuroanatomy and neuropathology could well be shifted from the basic science years. A correlated suggestion was that physical diagnosis be instituted very early to give the student a foundation on which to build his basic science study.

This participant believes that all departments teaching courses during the first two years are attempting to provide too much detailed systemic knowledge of each subject. Careful evaluation of curriculum content by the department would permit shortening of all the current courses, thereby allowing time for the development of new required and elective courses.

How far should the teaching of microbiology and pathology during the first two years be directed toward training the student in practical diagnostic methods?

During the teaching of pathology and microbiology to first and second year medical students it would be almost impossible to omit training in practical diagnostic methods. I feel, therefore, that this objective is being achieved. I do not think that one should neglect to teach the student those aspects of pathology and microbiology which appear to have no immediate application to diagnosis, prevention or treatment of disease for it is in these areas that progress will be made.

Instruction in practical diagnostic methods is desirable. Plans have been made to emphasize training in this area.

The objective in teaching microbiology and pathology during the first two years should be "education" rather than "training." However, one cannot be educated without acquiring some training.

Very little. The training should be limited to those which the practitioner might well be able or be expected to do in his own office and practice. In microbiology in general, an attempt should be made to familiarize the students with proper diagnostic methods in order that they will better appreciate and evaluate laboratory reports. They should be taught to know which tests will be of most importance to them in establishing a diagnosis, and, knowing that, they can then determine what specimens should be collected and how they should be submitted.

Only to that degree necessary to give the student a basic knowledge of the diagnostic methods and their interpretation. I do not believe that the student should be drilled to acquire technical dexterity in specialized procedures.

Teaching of microbiology and pathology during the first two years of medical school should be primarily directed toward giving the students a firm grasp of fundamental principles.

We feel that pathology should be taught in the second year of medical school. By teaching pathology through the natural history of disease the teacher should automatically lead the student to the methodology in diagnosis, but not necessarily practical diagnostic method.

The pathology department staff answered this question in the following manner: Differences of opinion were encountered on this topic. Some felt that training in these fields should only provide an appreciation of the diagnostic possibilities and limitations and something of the techniques involved. This possibility would be dependent on some such rearrangements as discussed in Special Topic No. 1. Under the present setup it appears that there is considerable overlap between diagnostic features and the morphologic changes necessary to complete an understanding of disease processes; hence, trimming in this area is dangerous.

This participant believes that the training of students in practical diagnostic methods during the first two years should be included in a carefully integrated course which includes an introduction to all general diagnostic methods. Such a course would permit the student to develop an appreciation of the manner in which methods of all the basic sciences may be applied to the study of clinical problems and to develop an understanding of the value of

the methods of histology, biochemistry, biophysics, psychology, microbiology, etc., as practical diagnostic procedures.

Should undergraduate medical education be designed differently for students planning a career of teaching and research as opposed to that for students planning to engage in medical practice?

It is our feeling that students both in teaching and research, as well as those planning to practice medicine, should be taught in a similar fashion. Undergraduate medical education should be the same for both.

This is a fine question, but rather Utopian. What schools in the country are in a position to offer two alternative curricula at the present time? Certainly not ours. My answer to the question would certainly be yes. The interests, needs, etc., of those planning for a career of teaching and research are quite different from those planning on private practice. Part of the current difficulties in medical education may stem from this, trying to give courses which emphasize too much of one or the other aspects of the particular science in question.

In the case of the physician, the education for teaching and research should gradually begin during medical school but should be concentrated on a postgraduate effort. With the M.D. and the Ph.D. present in medical sciences departments, no further subdivision of the M.D.'s should be made.

The tutorial system as it exists at this school helps the student who is interested in an academic career get started with a research project in the third year.

No, except possibly more elective time should be made available to all medical students. This then would permit the individual who is interested in research or teaching to have an opportunity to engage in some small measure of those activities.

No. A career of teaching in the medical sciences is rather empty if not continuously nursed by practical experience. The best teachers of medical subjects are those who are concerned with the practical problems in their respective divisions.

The pathology department staff answered this question in the following manner: One of the most promising suggestions in this area was that instead of different curriculum design, the entire area of medical training could be made flexible by the great use of elective courses.

This participant believes the answer to this question is no.

Students only rarely begin the study of medicine with the idea of continuing in research after graduation. I think it would be a mistake to attempt to force such a division of interest at the undergraduate level. Research training should properly be considered as a postgraduate activity. There is good reason to suppose that men who have had a broad training in medicine are better able to do research even in relatively specialized fields.

It would seem well, however, to provide research opportunities for those students who show an interest in the subject during their undergraduate period. Such opportunities might occur in elective courses or through assistantships during vacation periods.

No, but undergraduate education should be flexible enough to encourage and to take care of the needs of potential teachers and investigators.

Medical education should be sufficiently well grounded in basic medical sciences so that the student who finds during his third or fourth year, or even later, that he is interested in a career in teaching and research will have a sound background on which to build. I believe that a major proportion of our current medical research is carried on by people who made the decision at that stage in their career.

For those who know early in their college work that they want to go into programs of teaching and research, it would be desirable to have a separate program of training. I do not believe this is possible in more than a few centers in the country. From what I know of it, I believe that Harvard's program along this line is an excellent one, and should be continued.

Improved medical care in the field with which I am familiar, infections, has advanced more from research accomplishments than from any other factor during the past 20 years. Future research progress should be one of the major objectives of all medical education. This means that all first class medical education should provide an adequate background for those students who will be in a position to contribute to research accomplishments in the future.

No. The primary purpose of a medical school is to train practitioners at the undergraduate level. Specialization is a postgraduate function. Furthermore, a considerable number of students who enter the course with one field in view change their minds as they become familiar with other aspects during their training. Early differentiation of the course would tend to hamper

any re-evaluation their further experience gave them.

Do you feel that instruction leading to a clear understanding of the basic principles of probability should be offered to medical students? If the answer is yes, explain how these principles can be included in the curriculum. Consider matters such as time allotment, when taught, by whom and how.

While there has been a great deal of stir concerning the statistical approach in the biological sciences and while its importance cannot be underrated from the standpoint of general medical improvement, its direct application in medical practice is difficult to evaluate. We have become so dissatisfied with the whole structure of the first year of medical education that we have come to the conclusion that it would be wise to give the students two or three months of orientation in the medical sciences. This should include: (a) methodology in each field which would be encountered; (b) orientation toward final objectives; (c) statistics and (d) library and medical writing.

This is a problem in biostatistics and as such is legitimate in the medical curriculum. Better put it in the third or fourth year after the student has gained a satisfactory conception of the nature of the data with which biostatistics deals.

I think the student should be exposed to sufficient statistics so that he has some idea of quantity and the evaluation of data and claims. He may then realize that therapeutic claims based on five cases, or what the detail man of the drug house tells him, may not be entirely in order. I would favor a carefully planned elementary course in statistics during the first year. Then, these principles may be illustrated by specific examples of data in the various basic sciences—e. g., therapy, epidemiology, effectiveness of vaccines, etc. Probably some 12 hours of instruction may suffice to serve as a background. As to whom should teach statistics, it does not matter much, whoever is competent and interested.

Principles of probability should be offered to medical students, perhaps best in the second year in bacteriology or pharmacology. However, the decision of which department should give the introduction will depend on the presence of a competent and interested teacher.

In later years preventive medicine should take the subject up again. Statistical methods are extremely important for an appreciation of laboratory data obtained in clinical pathology and are widely used in this course.

Yes. Some knowledge of probabilities, standard errors, limits of tolerance, etc., would be valuable.

This can be accomplished by a 20-hour course in biostatistics given, on the usual university campus, by a professor of mathematics, genetics, or biology, and in isolated schools by a concentrated course by a visiting professor.

Best taught in first semester, first year.

How? A didactic course with simple demonstrations.

It was the consensus that instruction in this area is needed and at this time should consist of introductory courses in biostatistics. With biostatistics, as in genetics, time is required to train a generation of instructors with a sound understanding of statistical principles.

Yes. The diagnosis of disease is frequently reached by utilization of the basic principles of probability and, insofar as this is true, it is necessary for the student to be aware of these principles. It is not our thought at the present time that a special course should be designed in such thinking, but rather that these principles should be considered in the various clinical departments and in such preclinical departments as are applicable, such as pathology and bacteriology. They should be interspersed throughout the experience of the student in all of his clinical experience.

Instruction leading to an understanding of the principles of probability should be offered to medical students. This could easily be done by having a capable staff man with a major interest in statistics teach a class at certain scheduled hours normally occupied by any of the preclinical sciences. That is, in microbiology, pathology, physiology, pharmacology or anatomy the evidence to support a particular principle could be obtained from the original literature and presented as a part of that subject matter of the course in statistics. At this point the instructor in statistics could take over for the appropriate number of hours. This would give a maximum integration and a clear understanding of the significance of probability to the students. I do not believe such integration is essential. It seems to me that if the instructor chooses problems of a similar sort and gives them at times specifically assigned to the course in medical statistics, the students would do an equally good job of carry-over to their subject matter courses and to their future reading.

I feel that medical students should have

a clear understanding of the basic principles of probability, but I believe that there are almost insuperable difficulties in the way of offering such instruction in the undergraduate medical course. Since it is a subject that has no necessary connection with medicine, it should be insisted upon as a subject to be mastered during premedical education.

Yes. I would prefer, though, to say a "general" understanding (assuming that clear understanding might mean advanced understanding of the mathematical derivation of formulae).

I believe it should be taught early in the course. While the subject seems to have been assigned by tradition to departments of preventive medicine, it could be taught in any department depending on the interest and capability of the individual teacher so assigned. A minimum of about 20 hours would seem to be essential and should include practical assignments as well as didactic lectures.

Some European medical schools are known to depend heavily upon lectures and text sources for instruction rather than upon laboratory experience and practical work. If we in this country have gone too far in the opposite direction, how can we achieve a proper balance, and what is the proper balance?

A proper balance may be obtained by doing more instruction through small, informal discussion groups and conferences, the "proper balance" being defined as giving the student more of an opportunity to do his own thinking. At present this would seem to be impossible due to an inadequate number of faculty members as well as the necessity for re-defining the aims of medical education as to the quantity of material taught versus what constitutes the truly "essential" information.

The more laboratory work, the better.

Variety in teaching techniques is essential to good teaching. Enslavement to any one teaching technique, especially the old so-called classical laboratory method, has almost destroyed the usefulness of pathology in the curriculum. Use the teaching technique which is most adaptable to the specific problem to be solved with the student and invent a new one if it is indicated.

A good textbook is absolutely essential to the student's learning procedure. With the prevalent limitations in the departments of pathology throughout the U. S. with respect to teaching materials, equipment, teaching staff, allocated teaching time and teaching organization, procedure and techniques, the student learns most of what he remembers from his textbook.

This is a $64 question. I do believe that maybe American schools have given too much time to the laboratory, at the expense of discussion and time for the students to digest and understand what they are doing. Maybe a balance of 40-60 or 50-50 might be better than the existing distribution of time between exposition and laboratory work. In my opinion, however, laboratory work is essential beyond question. But what to give and how to emphasize it are not simple matters to decide.

In many schools of this country there is too much time spent in the laboratory, time which might be better utilized in permitting capable students to go ahead with electives, special problems, or even research. The time spent in practical work in the laboratory holds down the class and does not allow for mental development of those who might be gifted. Lectures, particularly in respect to orientation and principles, are very necessary and should be so given as to stimulate the student in seeking more information, thereby developing his curiosity. A proper balance might be obtained if one were to have laboratory sessions changed to project teaching which will establish the principles. The pathologist can better teach the natural history of disease by project teaching than by routine laboratory methods such as museum specimens and slides.

We have not gone too far, but we should not go so far as to give up daily contact with our students. Even in textbook study the student needs guidance. In laboratories he needs constant help but not "s-mother love."

To assume that the average modern American medical student is a well-oriented urbane citizen of the scientific world, able to manage his own scientific nourishment and metabolism, to observe, conclude and above all to judge the validity of published data, is a fallacious assumption. He needs guidance and plenty of it, not by stuffing him with facts, but by answering his questions.

The proper balance still, to my mind, requires a textbook, a lecture hour (or conference or quiz, just so minds meet) and then practical demonstration and observation, followed by examinations (the more informal the better) to show both

teacher and student how effectual (or ineffectual) the teaching has been.

Mere passing of examinations is not enough proof of proficiency. A certain minimum of experience under supervision must be required.

This question poses a philosophic consideration that requires at least a generation to achieve an adequate answer, and it also requires methods of evaluation that have not been developed, so far as I am aware. In a medical class we are dealing with a population that varies rather widely in native ability and to a lesser degree in background at the time the instruction in medicine is started. It would seem logical that the instruction should be rather largely tailored to the individual's need for it, as it is apparent to any teacher that some students learn quickly and well with a minimum of guidance and specific instruction while other students can be made to achieve a quite satisfactory level of proficiency if sufficient time and effort can be expended on them. I think we cannot escape the realization that there is a limit to the amount of time and money that can be expended in the instruction of medical students. This raises the question of the proportion of the population's free funds that can properly be expended in medical education, and for that matter, in medical care. It also poses the rather serious problem of finding and holding a sufficient number of highly skilled instructors to do this individualized type of teaching. It is obvious that the quality of teaching among a group of instructors varies widely and that some compromise is ordinarily necessary in our attempt to train our medical students to the best possible level of knowledge and proficiency.

In our school it is estimated that at least 50 per cent of the time the student spends in the laboratories of microbiology and of pathology is of little benefit. For example, many sophomore students do not know how to use a microscope effectively and despite college and freshman experiences are still unfamiliar with simple equipment and reagents in biochemistry. We believe that one very important contributing factor is that the medical student has learned (the conditioning begins in college) that the faculty is not really serious about his laboratory experiences and that no objective evidence of his dexterity or ability to do laboratory work will be required for his advancement.

Secondly, many of the minds attracted to medicine have not had rigorous training in the experimental-observation method or in mathematics and, therefore, are poorly fitted for real laboratory experiences. How could they be? The colleges for the past 25 years have been emphasizing the humanities as the best background and preparation for medicine. As a result, laboratory experiences in general for the average medical student are not rewarding.

Our suggestion in brief, therefore, is to do much more by definitive demonstrations, seminars and discussion groups and to limit actual laboratory sessions to rather simple experiments and techniques which permit drill and ample illustration of the scientific method. Some time will undoubtedly be regained by such changes and this should be devoted to outpatient and ward experiences under very careful supervision and guidance.

Regarding relationship of lectures to laboratory experience, it is my opinion that some teachers in some schools have gone too far in stressing laboratory experience. It is my opinion that the majority of those who have done so are not competent lecturers and so are not proficient in this method of imparting information. In my opinion, this problem strikes at one of the basic defects in teaching, that many who profess to be teachers, and who have important teaching positions, are actually quite incompetent in this field.

The question is posed, "How can we achieve a proper balance?" A step in this direction might be provided by a system of comprehensive examinations very similar to, if not the same as, those prepared by the National Board of Medical Examiners. Evaluation of results in different schools would provide a basis for self-evaluation and correction, if need be.

This question cannot be answered. One can only express opinions on certain points. First of all, what is the purpose of a lecture? To my mind the only purpose of a lecture is to give to the students the benefit of the experience of the instructor. A lecture which consists of an outline of a textbook or an outline even of a conglomeration of textbook material is useless. There is no benefit to the translation of the instructor's notes into the notebook of the student. However, it appears to me to be of great value to the student that they get the benefit of an instructor's viewpoint on the problems dealt with in textbooks, and the lectures of the instructors should largely consist of his own personal experiences with the problem with which he is dealing.

The utilization of text sources appears to be important although it is undoubtedly true that textbook material by the time it is published is already out of date in some aspects. The general principles and general views contained in textbooks nevertheless are frequently quite valid. In the mind of a student who has no experience he must have some reliable source from which to gain his concepts about medical principles and to provide for him the tools with which to think. For this purpose text sources are essential. There is, it seems to me, some danger in expecting a student to gain larger views of principles involved by immediately introducing him to laboratory procedures designed to test specific ideas. In this way, to use an old saying, the student is often placed in the position where he cannot see the forest for the trees.

It is difficult to assess the value of any laboratory exercises. The student is apt to find that the most simple type of experimentation is a baffling procedure. This is especially true when he is confronted with an array of unfamiliar laboratory apparatus which refuses to function according to the directions given in the laboratory manual. He becomes so bemused with the techniques involved that he forgets the purpose of the experiment and does not remember the principles involved. By the end of the course he finds himself in possession of a notebook filled with data, some of which is illegible, much of which was obtained from classmates, and all of which is forgotten as soon as the final examination is finished. In later years, during alumni-faculty gatherings, the man who barely managed to get through the laboratory course recalls fondly the laboratory work as he reminisces over cocktails with his former professor.

The exceptional student not only is interested in the laboratory work but obviously benefits a great deal from it. This category would include not over 10 per cent of the class. I believe that a critical review of present teaching practices is necessary, and it is unfortunate that the present questionnaire has made no provision to obtain such information. The questionnaire is concerned too much with generalities and not enough with specific details. Even though the participants come to the conference prepared to discuss the intricacies of their respective courses, it would be difficult to correlate the information during the course of the conference.

I believe we have gone too far in the U. S. toward the worship of the laboratory method *for medical students.* The proper balance defies sharp definition, but it is one in which laboratory work does not reach the repetitive stage or involve procedures of interest only to the specialist. Practical work is essential for an understanding of how laboratory procedure is used to obtain new knowledge in the field and to provide aid to the clinician. It should be adequate to provide an understanding of the technical evaluation and especially interpretation of the results.

The customary ratio of one hour of lecture-conference to two hours of laboratory includes too much laboratory. We expect hereafter to use approximately one-third of total laboratory time for discussion groups, conferences, quiz selections and audiovisual aids.

The proper balance is away from texts and lectures and towards more and more personal contact.

Lectures can be depended upon far too heavily for instruction and become an obstacle to education if they assume such importance that the student considers them as completely adequate. The lecture nevertheless, is an almost indispensable tool in education, and medical education in particular, provided that the lecture serves its proper function. The principal function of the lecture is to stimulate the interest and imagination of the student and this is accomplished in striking fashion by only a few really superb teachers, but it is accomplished to a useful degree by teachers who are only moderately good. The lecture should illuminate and render more meaningful the material presented, and this should be true even when the factual material is already well known to the student. If the student is allowed to dig for himself in practical and laboratory work, the lecture is still necessary to confirm or correct the direction of his thinking and to inspire and stimulate him to further effort. The proper balance between lectures and laboratory work is one which gives the student a proper alternation between exposure to practical problems which test his abilities and which he may or may not be able to solve, and a period of illumination and fresh inspiration which should be transmitted by a lecture. The exact periodicity of the alternation cannot be positively determined, but should be such that the student is not called upon to wrestle with practical problems so long

without further guidance that he becomes discouraged. The lecture is also required to give perspective and a sense of proportion in a new field that the student is attempting to master. In my opinion, if teachers are available of sufficient quality to be worth listening to, there should be no less than one lecture per day in one subject or another. Two lectures per day in one subject or another would come close in my estimation to an optimal division between lectures and the practical work which should occupy the rest of the day. Three lectures in one day are too many.

I should think the proper balance about 50-50.

The laboratory procedures in second year bacteriology should be directed primarily toward the demonstration of principles set out in the lectures, i. e., the production of immunity in animals by the injection of vaccine and the subsequent demonstration of antibodies by the agglutination test.

Insofar as it is technically possible, the students should carry out these procedures themselves. Bacteriologic diagnostic procedures used by practitioners are limited and constitute a basic, relatively simple portion of the above program, i. e., gram stain, acid fast stain, examination of exudates, etc.

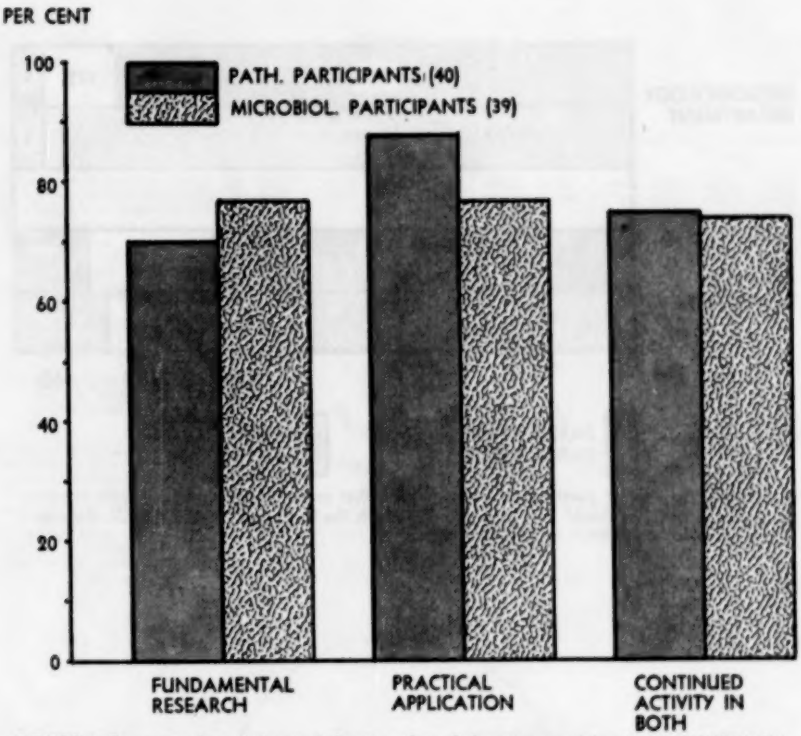

FIGURE 1. Per cent of participants indicating that: (a) active participation in FUNDAMENTAL RESEARCH, (b) active participation in the PRACTICAL APPLICATION of subject matter and methods to medical problems and (c) CONTINUED ACTIVITY IN BOTH are necessary to develop and retain the characteristics of a good teacher.

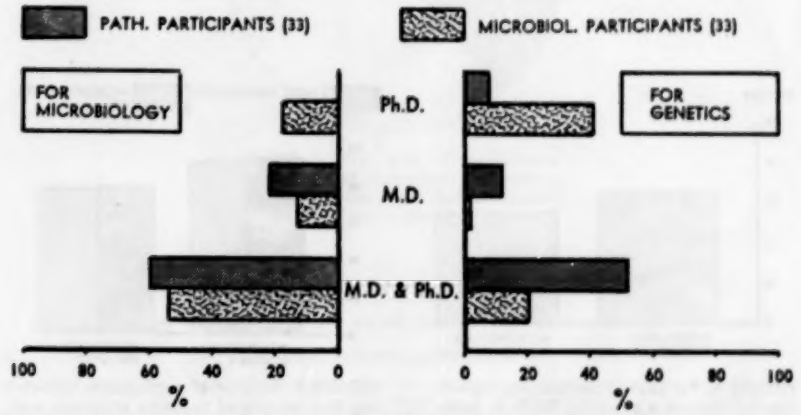

FIGURE 2. Per cent of participants indicating that the Ph.D. only, the M.D. only, or both Ph.D. and M.D. degrees provide the best preparation for teaching microbiology and genetics. (Percentages are based on the total number of participants; an average of 24 per cent gave no response or non-usable responses.)

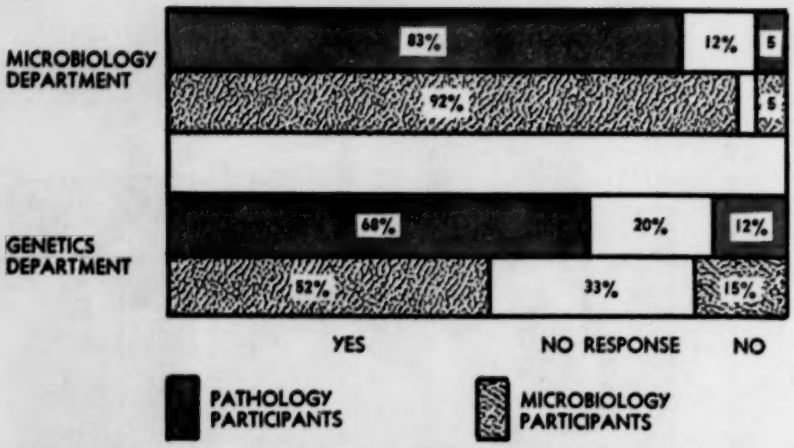

FIGURE 3. Per cent of participants indicating whether or not teaching departments in microbiology and genetics should have some teachers with the Ph.D. and some with M.D. degrees if it is impracticable to obtain staff holding both.

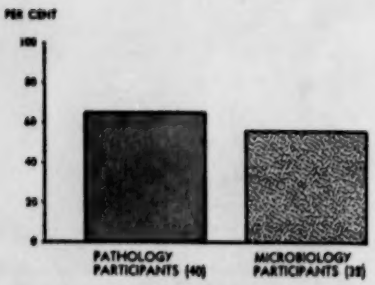

FIGURE 4. Per cent of participants indicating that there is a place for the Ph.D. (without M.D. degree) in pathology.

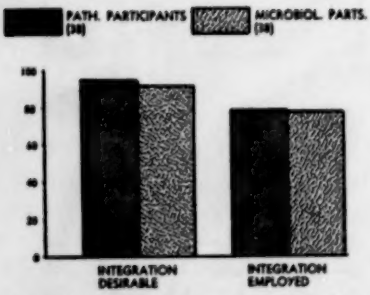

FIGURE 5. Per cent of participants indicating that integrated teaching programs are (a) desirable and (b) employed at their institutions.

TABLE 1

TEACHER TRAINING

Responses from participants

	Pathology			Microbiology			Total		
If instruction in teaching techniques should be a part of teacher training (see Figure 6), how can it best be accomplished?	Little value	Some value	Great value	Little value	Some value	Great value	Little value	Some value	Great value
Formal courses in theory and techniques of teaching	8	17	3	20	10	2	28	27	5
Courses in tests and measurements	13	11	4	18	14	2	31	25	6
Assistantships or preceptorships in teaching	1	10	18	4	11	21	5	21	39
Staff conferences on teaching as courses are given	3	9	19	4	9	21	7	18	40
Providing facilities for contact with teachers in other schools by visits, sabbatical leaves, exchange lectureships	3	14	14	5	15	16	8	29	30
Guest lectures to faculty on special topics, e.g., examinations by specialists in education	12	14	2	20	9	6	32	23	8
Other	0	1	1	0	0	1	0	1	2
If student preceptorships in teaching are desirable in your opinion, should they be a part of the regular instruction or should they involve additional periods of time at the expense of delaying the degree?	Delay		No delay	Delay		No delay	Delay		No delay
	9		23	11		23	20		46
Would support of such assistantships be a worthy objective for foundations concerned with upgrading medical education?	Yes		No	Yes		No	Yes		No
	24		8	26		7	50		15

FIGURE 6. Per cent of participants indicating that instruction in teaching techniques should be a part of teacher training. (See also Table 1.)

TABLE 2

REPORTS ON TEACHING FROM FACULTY AND/OR STUDENTS

Responses from participants

	Pathology		Microbiology		Total	
Does your faculty get a report on teaching?	Yes	No	Yes	No	Yes	No
from committees of faculty?	15	22	7	26	22	48
from committees of students?	24	13	24	10	48	23

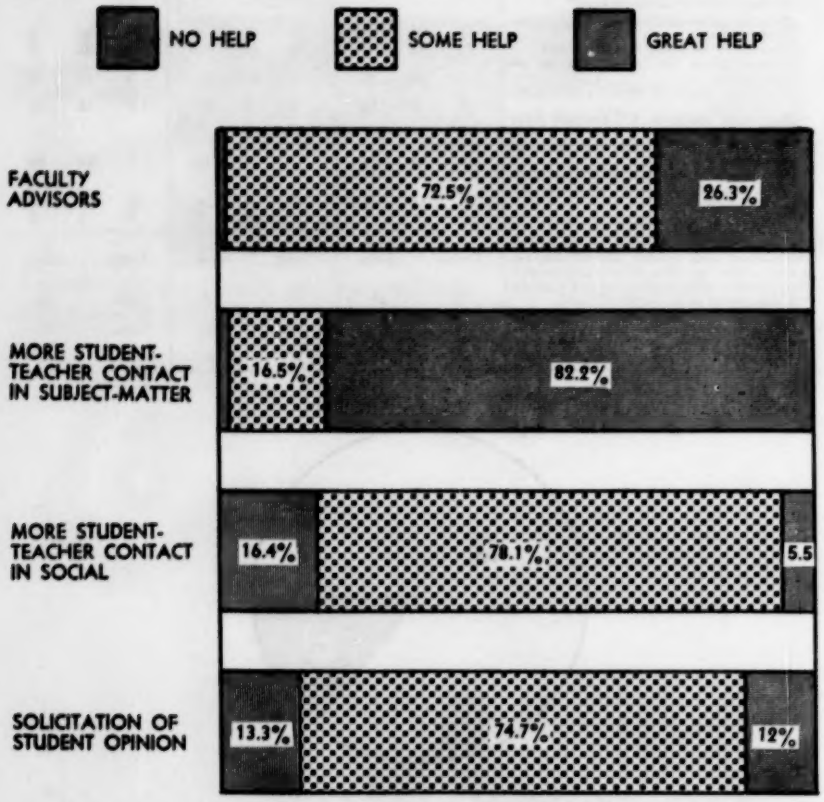

FIGURE 7. Per cent of participants indicating the extent to which (a) faculty advisers, (b) more student-teacher contact at the subject-matter level, (c) student-teacher contact at a social level and (d) solicitation of student opinion, are of help to the teacher in better understanding student learning problems.

TABLE 3

WORK-LOAD OF TEACHERS

Responses from participants

	Pathology	Microbiology	Total
(1) Activities for which the departments of pathology and microbiology are responsible			
Teaching	73	74	147
Examining patients or performing clinical laboratory tests			
Is this expected?	59 Yes—26 No—8	40 Yes—27 No—7	99 Yes—53 No—15
Examining patients or performing clinical laboratory tests on cases referred from neighboring medical organizations			
Is this expected?	51 Yes—19 No—17	43 Yes—22 No—9	94 Yes—41 No—26
Examining patients or performing clinical laboratory tests in neighboring medical institutions			
Is this expected?	35 Yes—11 No—22	23 Yes—15 No—16	58 Yes—26 No—38
Research	68	68	136
Other professional activities	11	10	21

(2) Service functions for the hospital and school as a whole expected from the departments of pathology and microbiology	No. schools	Per cent outside inst.	No. schools	Per cent outside inst.	No. schools	Per cent outside inst.
Clinical pathology examinations on patients, such as						
Microbiology	26	8.5%	34	24.5%	60	32.10%
Serology	27	15.1	21	29.5	48	44.6
Hematology	37	23.6	1	0.0	38	23.6
Clinical Chemistry	30	6.3	1	0.0	31	6.3
Blood Bank	23	7.9	2	.5	25	8.4
Performance of autopsies (average number per year for the schools responding to questionnaires—836)	59	45.3	1	.5	60	45.8
Surgical pathology service (average number per year for the schools responding to the questionnaires—12,926)	62	47.4	3	1.0	65	48.4
Exfoliative cytologic diagnosis (average number per year for the schools responding to the questionnaires—6,507)	47	48.9	0	0.0	47	48.9
Supervision of machine, electronic or instrument shop	1		2		3	
Supervision of photographic department	28		3		31	
Supervision of animal care	11		16		27	

TABLE 4

TEACHING OF CLINICAL PATHOLOGY

Responses from participants

A. *Describe how clinical pathology (hematology, clinical chemistry, clinical bacteriology) is taught to students at your school*

Classification	*No. of responses*
Lecture, demonstration, laboratory	40
Lecture, demonstration, laboratory, autopsy cases	2
Lecture, demonstration, laboratory, clinical cases	3
No organized course	2
Organized highly but integrated with pathologic anatomy	4
Not clearly stated	28

Note: Juniors and seniors responsible for laboratory work on patients (8 schools); advanced clinical pathology taught in junior year during medical quarter (1 school).

B. *What department (or departments) is responsible for the clinical pathology course?*

Classification	*No. of responses*
Medicine (including division of clinical pathology where such is under department of medicine)	26
Pathology	15
Clinical pathology (autonomous department)	5
Pathology and medicine	5
Medicine and pathology	5
Pathology and microbiology	3
Medicine and microbiology	2
Group of departments with pathology participating	7
Group of departments with pathology not participating	6
One response each for: medicine and biochemistry; pathology and biochemistry; pathology with clinical departments; pathology and clinical pathology; clinical pathology and bacteriology	
Not stated	4

C. *How could the teaching of clinical pathology best be improved in your school?*

Classification	*No. of responses*
Increased clinical application, correlation and interest	17
Increased or better supervision of clinical clerks' laboratory work	12
Improved facilities	7
More teachers	6
Increased time allotted	5
Better liaison or correlation with morphologic pathology	5
Better liaison between interested departments	4
Increased basic science taught in course	3
Extension of formal teaching of clinical pathology to clinical years	3
Increased use of residents as laboratory assistants	2
Incorporation of more clinical chemistry	2
Incorporation of more microbiology	3
Use of more fresh teaching material	2
More teachers from other departments	2
More seminars	3
More inspired teaching	2
One response each for:	
Incorporation of more hematology	
Decrease of emphasis on hematology	
Incorporation of more serology	
More quizzes	
Pathology to administer	
Extension of formal teaching of pathology and microbiology to clinical years	
Move of clinical pathology to sophomore year (now taught in third year)	
Single staff for course	
Incorporation of advanced microbiology into third and fourth years	
Closer integration of lecture and laboratory sessions	
None suggested	21

TABLE 5

EXAMINATIONS IN CORRELATED COURSES AS DESCRIBED BY PARTICIPANTS

A. *What departments are concerned and what courses or subjects covered?*

Departments concerned	*No. of responses*
Pathology	13
Medicine	9
Microbiology	8
Pharmacology	3
Psychiatry	2
Public Health	2
Biochemistry	1
Physiology	1
Other clinical departments	3
"All" departments	1

Subjects covered	*No. of responses*
Medical microbiology	5
General pathology	5
Clinical pathology	4
Special pathology	2
Physical diagnosis	2
Parasitology	1
Clinical hematology	1
Psychiatry	1
Public Health	1
CPC	1
Clinical conference	1
Clinical bacteriology and serology	1
Pathologic physiology	1
"Special course"	1

B. *What type of examination is given in correlated courses?*

Classification	*No. of responses*
Essay	11
Objective	7
Multiple choice	4
True-false	3
Fill-in	3
Practical	2
Oral	2
Tabulation	1
Comprehensive	1
Case history—objective	1
Case history—interpretation	1
Pairing	1
Varied	1

C. *How are examinations graded in correlated courses?*

Classification	*No. of responses*
Questions graded separately by each department	9
Department with major responsibility grades	3
Microbiology grades	1
Committee	1

D. *Is one combined final grade given by two or more departments participating or by each individual department?*

Classification	*No. of responses*
Separate	9
Combined	6
Combined and separate	1
Class rank only	1

TABLE 6

OPINIONS OF PARTICIPANTS CONCERNING EXPERIMENTS IN THE TEACHING OF PATHOLOGY, MICROBIOLOGY AND GENETICS

Describe any experiments in the teaching of pathology, microbiology, and genetics that are being carried on in your school

A. *Summary of teaching experiments reported*

Curriculum

- Dropped surgical pathology; teaching advanced pathology in third year
- Junior electives in liver disease, use of biopsy, departmental conferences, obstetrical pathology, exfoliative cytology
- Integrated course in medical science for Ph.D. candidates
- Course in "special pathology" (pathologic physiology?) by pathology, physiology, and clinical departments
- Integration of pathologic anatomy and clinical pathology into single course

Teaching techniques

- Student journal seminars in microbiology and/or pathology
- Correlators from medicine department discuss clinical aspects of fresh autopsy material
- Member of radiology department shows films on some subjects discussed
- "Correlation symposium"
- Recommendation of two widely different texts
- Museum with specimens on open shelves, "handled like books"
- Microbiology course built around student examination of clinical specimens and "clinico-bacteriological conferences"
- Final exams for borderline cases only
- Students given lecture outlines
- Students present course in genetics
- Student experiments (elective and required) —several schools
- Student CPC's—several schools
- No pathology lectures; bacteriology organized into small seminar groups which meet regularly with instructor-moderator to discuss topics of students' selection.
- Student fellowships in pathology or bacteriology
- Expressing anatomical diagnosis in form of genealogical tree
- Freezing cabinet display of autopsy material, changed weekly
- Case teaching in laboratory

B. *Description of selected teaching experiments*

Curriculum

1. A course in advanced pathology is taught in lieu of surgical pathology in the third year. Details published in "Some Thoughts Regarding the Teaching of Pathology," *J. Med. Educ.*, January 1952.

2. A course given by the division of medical sciences for first year graduate students includes bacteriology, biochemistry, histology, pathology, pharmacology, physical chemistry and physiology. During the academic year selected topics are discussed on a research level. Each topic treated is reviewed from all possible angles, involving all disciplines participating in the course. Objectives of the course are (1) to improve the education of Ph.D. candidates and give them a broader background in the medical sciences, (2) to train teachers from all departments to integrate their own disciplines with others and (3) to create an atmosphere of unity between the various departments.

3. For the past two years clinical pathology and pathologic anatomy have been taught as a combined course by the department of pathology. The entire course is taught over a period of three quarters in the sophomore year. Pathologic anatomy and clinical pathology are integrated to the extent that generally a block of lectures and laboratory periods covering a field of special pathology is followed immediately by a block of lectures and laboratory periods covering the corresponding field in clinical pathology. After one year's experience, it was felt that interspersing single lectures and laboratory periods of clinical pathology after single lectures of special pathology proved too confusing to the students.

4. This participant believes that a large portion of the second year undergraduate medical education should be devoted to a study of the mechanisms of disease and the methods of observing and measuring the various manifestations of disease. This area of study should be organized into a single course and not be fragmented along lines of departmental organization or along lines of special techniques of study. Prerequisites to this course would include a basic knowledge and an understanding of the methods of the following subjects: anatomy, histology, embryology, genetics, biostatistics, psychology, biochemistry, physiology, microbiology (excluding pathogenic properties and host-parasite reaction) and history-taking in physical examination as applied to the normal individual. In other words, the student should acquire an understanding of the normal individual reacting in his environment and the methods of observing and measuring the structure and function of the normal individual in various stages of development. It is believed that by proper selection of curriculum content and by use of proper teaching methods, the teaching of these prerequisites could be accomplished during the first year of undergraduate medical education. The introduction to genetics might be included in the study of embryology and microbiology.

The primary objective of this course would be to help the student learn to study disease processes in a manner that would be of lasting value in his program of self-education. The specific diseases covered should be carefully selected to demonstrate:

(a) Various types of etiological mechanisms

(b) The relative value of the methods of various basic sciences as well as the taking of the history and the physical examination in the study of disease

(c) The various general types of local and systemic structural and functional responses to injury or mechanisms of stress

(d) The cardinal manifestations of disease and the relation to structural and functional changes

(e) The general gaps in present-day knowledge relative to disease

(f) The role of psychological and social mechanisms in etiology of disease

(g) The dynamic nature of health in disease
(h) The relative value of the methods of the various basic sciences in the clinical observation and measurement of the alterations of body structure and function associated with disease
(i) Basic principles of epidemiology
(j) The effects of various diseases on the psychobiologic unit, on the body as a whole and on various regions and organ systems.

A relatively small number of disorders should be selected for study and sufficient time should be allowed for complete consideration of each subject selected. During the last part of the course each student should be permitted to follow his own interests in the selection of disorders for study insofar as practicable.

This course should be the joint responsibility of a group of individuals whose interests cover the application of the methods of all the basic sciences and the methods of clinical medicine to the experimental and practical study of disease.

The teaching methods should vary depending upon the nature of the disease being studied. They should include: autopsy studies and preparation of reports, teaching clinics, laboratory exercises in the methods of clinical pathology, study of histologic sections, study by various methods of selected diseases induced in experimental animals, demonstration of the methods of history-taking and physical examination, clinical radiology, surgical pathology, clinical chemistry, clinical microbiology, hematology, clinical microscopy, and electrocardiography as examples of methods of observing and measuring the manifestations of disease. The role of psychic and social factors in disease should be clearly demonstrated.

The student should be helped to realize that there are no short cuts to a clear understanding of a disease process; that he must be able to bring together and analyze data derived from the application of the various techniques of all the basic sciences and of clinical medicine if he is to reach this goal. Efforts should be made to stimulate the student's intellectual curiosity and to avoid smothering this desirable trait under the weight of excessive factual information.

Teaching techniques

1. A regular feature of the microbiology course for many years has been student seminars at which individual students present orally abstracts of papers chosen from the current literature and relating to phases of subject under study.

2. A new pathology museum has been instituted in which specimens are readily accessible on open shelves like books in a library. Tables and good lights are available. Specimens are changed frequently.

3. A lantern slide museum (5,000 capacity) has been developed to supplement older jar and watch glass specimens.

4. Multidepartmental panel discussion of questions submitted by students.

5. Formal lecture in general pathology followed by demonstration of patient with illustrative clinical condition; the patient is demonstrated by a clinician.

6. Except for a preliminary period of training in bacteriological technique, the laboratory training in bacteriology is accomplished entirely by means of clinical specimens. Each specimen is accompanied by the "diagnostic impression." Students in microbiology requisition necessary media, report on results and discuss the findings in "clinico-bacteriological conferences."

7. It is hoped by outlining lecture notes and distributing them to the students to decrease the amount of time spent in the mechanics of writing and to permit increased time for discussion.

8. Students present a large portion of the course in genetics, their presentation covering the genetic aspects of specific diseases studied in the course in systemic pathology.

9. Radiologic material is correlated with the pathologic features of specific diseases.

10. No didactic lectures have been given in the pathology course since the opening of the school. This has proved very satisfactory and can hardly be called experimental any longer.

11. The bacteriology class has been organized into small seminar groups which meet regularly over several weeks to discuss topics selected by the students. A faculty member acts as moderator.

12. Pathology as usually taught is too much concerned with lesions of individual organs. We approach the students with weekly problems. For example, a list of findings obtained at autopsy together with selected clinical and laboratory data. These data are then correlated in a scheme resembling a genealogical tree. This program has created extraordinary interest.

13. The case teaching method is used in the laboratory. Ten students, each with a clinical summary of a case, study the gross organs and microscopic sections. Individual diagnoses are submitted at the end of an hour. An instructor then meets the group, corrects and discusses the diagnoses and orients the case to the appropriate subject.

TABLE 7

ENCOURAGEMENT OF TEACHING METHODS EXPERIMENTS

Responses from participants

Should experiments on teaching methods be encouraged?	No. of responses
Yes	74
No	3

TABLE 8

TEACHING EXPERIMENTS DISCONTINUED AND THE REASONS
Responses from participants

Teaching experiments discontinued	*Reason*
Mounted museum specimens	
Combined lecture-laboratory-exam-conference course	Lack of personnel
One hour weekly correlation course	Time consuming
Course built around student performance of eight autopsies	Lack of personnel
Correlated sophomore curriculum	Time consuming; difficult to arrange
Student experiments on carcinogenesis	Not enough time, animal care help
Students' CPC's	Lack of instructor time
Seminar teaching without lectures	Broke down in instructor level, fatty degeneration into little lectures
Correlation between pathology and clinical pathology	Due to difficulty in scheduling
A six-hour per week sophomore course in "research aims and problems"	Lack of time
Elective course in morbid physiology	Lack of well-trained staff
Vertical student units (preclinical, clinical, intern, resident—suggested only; not being tried)	
Experimental pathology	Too little return; too much effort
Laboratory examinations resumed	Students learned too little without them
Individual research projects by students dropped	Too short for significant benefit
Color photographs being substituted for jar specimens	
Faculty adviser for each student worked well for students with interested advisers	

TABLE 9

REPORT OF PARTICIPANTS ON ORGANIZATION OF TUMOR CLINIC AND/OR TUMOR CONFERENCE

A. *Departments regularly represented*

Departments	*No. of responses*
Surgery	54
Radiology	46
Pathology	46
Medicine	29
Obstetrics-gynecology	18
Dermatology	8
ENT	5
Surgical pathology	3
Genito-urinary	2
Pediatrics	2
Oncology	3
Plastic surgery	1
Radiotherapy	1

B. *Total hours of student instruction*

	Hours							
Year	0	1-20	21-40	41-60	61-80	81-100	101-120	Over 120*
Second		1		1				
Third		1		1				1
Fourth		1	1	1	1		1	2
Not specified	2	12	13	8	4			2

*Including clerkship

C. *Suggested improvements in tumor clinic conference*

Demonstrate Papanicolaou smears, proctoscopic, laryngeal examinations
Demonstrate biopsy techniques
Leave students out of tumor conference
Put the student to work as responsible participant over two-year period
All tumor cases should be referred to tumor clinic
Pitch tumor clinic at student level
Highly trained director needed
More than one staff member from each department

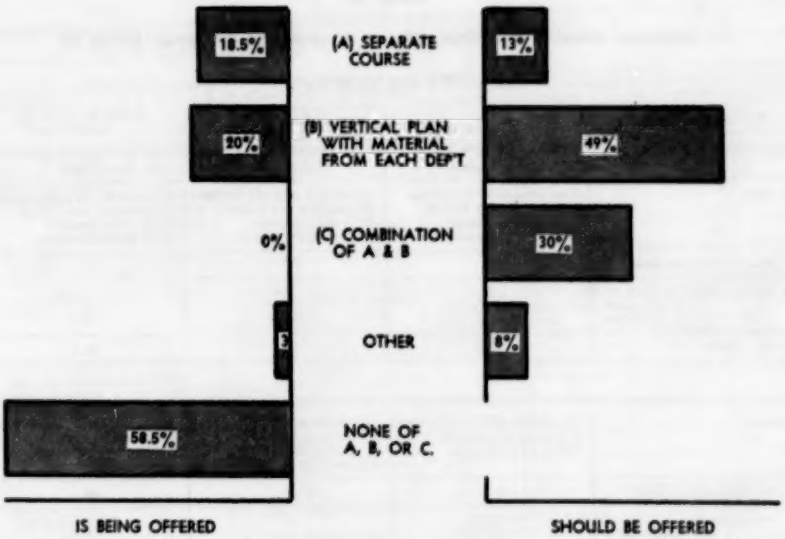

FIGURE 8. Per cent of participants indicating how material on human genetics (a) is being offered and (b) should be offered at their institutions.

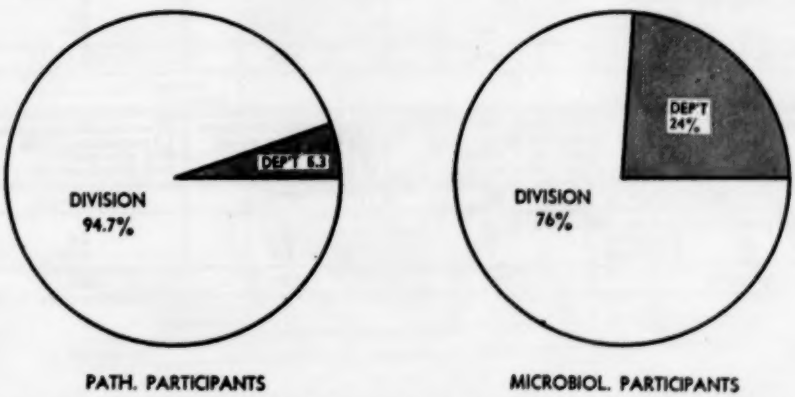

FIGURE 9. Per cent of participants indicating that genetics education should be administered as a separate department or as a division within a department. (Percentages based on responses of 19 pathologists and 21 microbiologists.)

TABLE 10

COURSES FOR MEDICAL STUDENTS TAUGHT BY MEMBERS OF DEPARTMENTS OF PATHOLOGY AND MICROBIOLOGY

Report of department chairmen

	Pathology	Microbiology	Total
1st year	5 schools offer 7 courses 1.5 courses per school 6.5% offer courses 93.5% give no course	16 schools offer 21 courses 1.3 courses per school 22% offer courses 78% give no course	21 schools offer 28 courses 1.4 courses per school 14% offer courses 86% give no course
Av. no. students in class	139	77	108
Av. hours/week: Lecture	2	2.5	2.13
Conference	.5	1.5	1
Laboratory	.5	5.5	3
Av. no. weeks	9.5	14	11.75
2nd year	72 schools offer 156 courses 2 courses per school 100% offer courses	70 schools offer 113 courses 1.7 courses per school 97% offer courses 3% give no course	142 schools offer 269 courses 1.9 courses per school 99% offer courses 1% give no course
Av. no. students in class	85	83	84
Av. hours/week: Lecture	2.25	3	2.63
Conference	1.25	1	1.13
Laboratory	5	6.5	5.75
Av. no. weeks	20	13.5	16.75
3rd year	52 schools offer 91 courses 2 courses per school 72% offer courses 28% give no course	11 schools offer 14 courses 1.3 courses per school 15% offer courses 85% give no course	63 schools offer 105 courses 1.65 courses per school 44% offer courses 56% give no course
Av. no. students in class	63	65.5	64.25
Av. hours/week: Lecture	1	1	1
Conference	1	4	2.5
Laboratory	1.5	7.7	4.63
Av. no. weeks	23.5	11.5	17.5
4th year	47 schools offer 71 courses 1.5 courses per school 65% offer courses 35% give no course	8 schools offer 14 courses 1.75 courses per school 12% offer courses 88% give no course	55 schools offer 85 courses 1.6 courses per school 39% offer courses 61% give no course
Av. no. students in class	69	47	58
Av. hours/week: Lecture	1	1	1
Conference	1	4	2.5
Laboratory	1	7.5	4.25
Av. no. weeks	26	13	19.5

TABLE 11

OTHER COURSES TAUGHT BY MEMBERS OF DEPARTMENTS OF PATHOLOGY AND MICROBIOLOGY

Report of department chairmen

	Pathology	Microbiology	Total
Graduate (for M.A. or Ph.D. candidates)	25 schools offer 45 courses 1.7 courses per school 34% offer courses 66% give no course	45 schools offer 188 courses 4.4 courses per school 51% offer courses 39% give no course	70 schools offer 181 courses 13.05 courses per school 49% offer courses 51% give no course
Av. no. students in class	27.5	107.5	67.5
Av. hours/week: Lecture Conference Laboratory	1 2 6.5	1.25 1 4	1.13 1.5 5.25
Av. no. weeks	27.5	17.5	22.5
Dental	20 schools offer 28 courses 1.4 courses per school 25% offer courses 75% give no course	18 schools offer 21 courses 1.15 courses per school 28% offer courses 72% give no course	38 schools offer 48 courses 1.25 courses per school 26% offer courses 74% give no course
Av. no. students in class	48.5	67.5	58
Av. hours/week: Lecture Conference Laboratory	3 1 5.5	3 1 5.5	3 1 5.5
Av. no. weeks	16.5	12	14.25
Dental hygiene	1 school offers 1 course 1.85% offer courses 98.1% give no course	7 schools offer 8 courses 1.05 courses per school 9% offer courses 91% give no course	8 schools offer 9 courses 1 course per school 6% offer courses 94% give no course
Av. no. students in class	15	13.5	14
Av. hours/week: Lecture Conference Laboratory	0 0 0	2 .5 4	1 .25 2
Av. no. weeks	0	13	13
Nursing	21 schools offer 23 courses 1.05 courses per school 29% offer courses 71% offer no course	35 schools offer 43 courses 1.2 courses per school 58% offer courses 42% offer no course	56 schools offer 66 courses 1.13 courses per school 44% offer courses 56% offer no course
Av. no. students in class	36	63.5	49.75
Av. hours/week: Lecture Conference Laboratory	2.5 1 3.5	3 1 3	2.75 1 3.25
Av. no. weeks	9.5	12	10.75
Pharmacy	1 school offers 1 course 1.85% offer courses 98.15% offer no course	15 schools offer 17 courses 1.1 courses per school 20% offer courses 80% offer no courses	16 schools offer 18 courses 1.1 courses per school 16% offer courses 90% offer no course
Av. no. students in class	50	32	41
Av. hours/week: Lecture Conference Laboratory	3 0 4	3 .5 4.5	3 .25 4.25
Av. no. weeks	11	13.5	12

Table 11 (Continued)

	Pathology	Microbiology	Total
Occupational therapy	4 schools offer 4 courses 1 course per school 5% offer courses 95% offer no course	3 schools offer 3 courses 1 course per school 5% offer courses 95% offer no course	7 schools offer 7 courses 1 course per school 5% offer courses 95% offer no course
Av. no. students in class	25	38	31
Av. hours/week: Lecture	2	1.5	2
Conference	1	0	.5
Laboratory	0	2.5	1.25
Av. no. weeks	16	13	15
Physical therapy	7 schools offer 7 courses 1 course per school 9% offer courses 91% offer no course	2 schools offer 2 courses 1 course per school 1% offer courses 99% offer no course	9 schools offer 9 courses 1 course per school 5.38% offer courses 94.62% offer no course
Av. no. students in class	20	87	53
Av. hours/week: Lecture	2.5	3.5	3
Conference	.5	0	.25
Laboratory	0	3	1.5
Av. no. weeks	13.5	17	14
Veterinary	4 schools offer 4 courses 1 course per school 6% offer courses 94% offer no course	2 schools offer 4 courses 2 courses per school 3% offer courses 97% offer no course	6 schools offer 8 courses 1.2 courses per school 5% offer courses 95% offer no course
Av. no. students in class	5.5	75	40
Av. hours/week: Lecture	1	3	2
Conference	2	0	1
Laboratory	0	6	3
Av. no. weeks	14.5	20	17
Medical technology	16 schools offer 16 courses 1 course per school 22% offer courses 78% offer no course	20 schools offer 30 courses 1.5 courses per school 27% offer courses 73% offer no course	36 schools offer 46 courses 1.3 courses per school 25% offer courses 75% offer no course
Av. no. students in class	12.5	18	15.25
Av. hours/week: Lecture	2	3	2.5
Conference	1	.5	.75
Laboratory	12.5	8.5	10.25
Av. no. weeks	28	17.5	22.75
Graduate medicine	15 schools offer 19 courses 1.2 courses per school 26% offer courses 74% offer no course	8 schools offer 9 courses 1 course per school 11% offer courses 89% offer no course	23 schools offer 28 courses 1.2 courses per school 18.5% offer courses 81.5% offer no course
Av. no. students in class	50	17	33
Av. hours/week: Lecture	1	3	2
Conference	3.5	1	2
Laboratory	6	3	4.5
Av. no. weeks	22.5	18	20
Other	16 schools offer 16 courses 1 course per school 22% offer courses 78% offer no course	20 schools offer 30 courses 1.5 courses per school 27% offer courses 73% offer no course	36 schools offer 46 courses 1.3 courses per school 25% offer courses 75% offer no course
Av. no. students in class	51	31.5	41.25
Av. hours/week: Lecture	1	2	1.5
Conference	2	1	1.5
Laboratory	2.5	5	3.75
Av. no. weeks	23	17	20

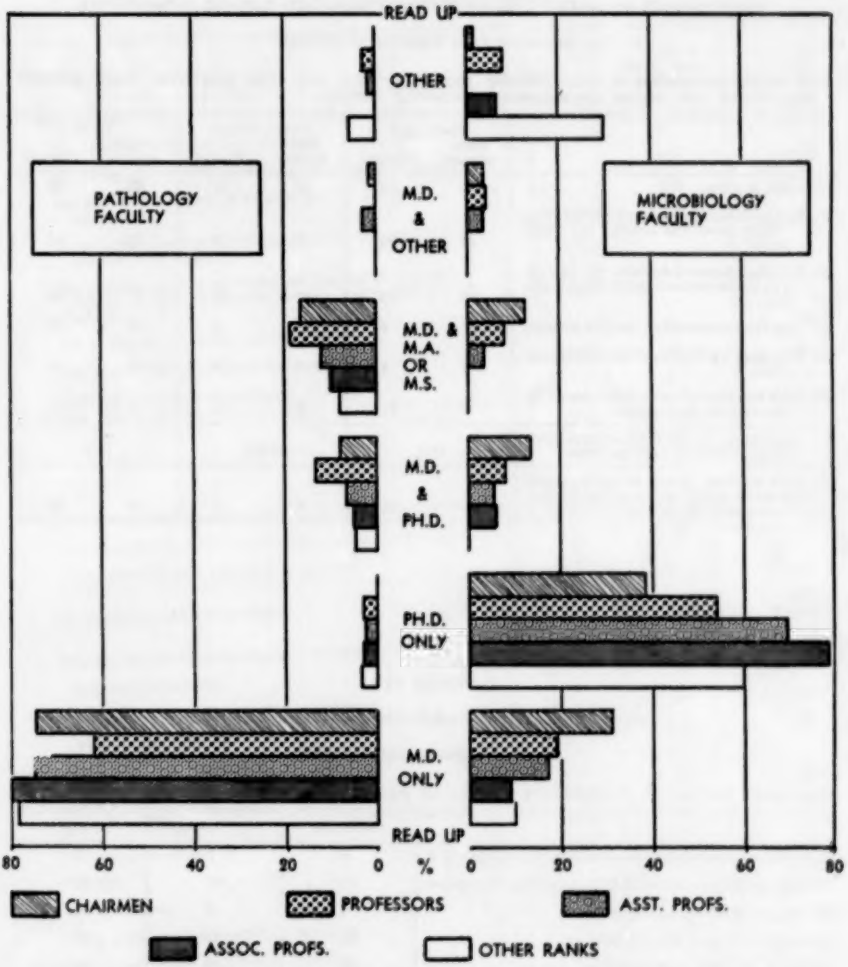

FIGURE 10. Percentage distributions of academic degrees among faculty respondents to questionnaire.

TABLE 12

CONSULTATION ON TEACHING BETWEEN BASIC SCIENCE AND CLINICAL DEPARTMENTS

Responses from department chairmen

How much consultation is there between your department and other preclinical (basic science) departments and clinical departments on teaching matters?

	Pathology		Microbiology		Total	
	Basic science	Clinical	Basic science	Clinical	Basic science	Clinical
(1) Little or none	33	24	29	35	62	59
(2) Simple division of subject matter, e.g., "We'll cover the kidney, you cover urine"	19	13	15	8	34	21
(3) Interdepartmental conferences on schedule, course content, teaching methods, etc.	26	15	27	18	53	33
(4) Very close correlation of lecture material	11	8	13	6	24	14
(5) Very close correlation of laboratory material	3	3	11	5	14	8
(6) Joint conduct of some laboratories by two or more departments	5	13	8	4	13	17
Av. percentage of total laboratory work accomplished by joint teaching	15%		17.5%		16%	
(7) Joint teaching of one or more courses planned, taught and attended by staff members of two or more departments	14	24	6	7	20	31

TABLE 13

REASONS FOR LIMITATION IN CORRELATIVE TEACHING

Report of department chairmen

What limits the amount of correlative teaching by your department members?

	Pathology	Microbiology	Total
Your own departmental or personal convictions against it	8	7	15
Time required for complex interdepartmental arrangements	48	37	85
Convictions of others against it	6	5	11
Limited staff in your own department	38	31	69
Limited staff in other departments	26	20	46
Physical difficulties	17	16	33
Limited teaching budget	17	22	39
Lack of interest in other departments	15	16	31
Other	15	17	32

TABLE 14

RESPONSIBILITIES AND TENURE OF PRESENT PERSONNEL IN DEPARTMENTS FOR MEDICAL STUDENT TEACHING

Report of department chairmen

	Av. no. in school		
	Pathology	Microbiology	Total
Summary data			
No. of full-time faculty appointments	5	5	5
No. devoting over 50% of time to teaching and research	3	4.5	3.75
No. devoting over 50% of time to hospital service functions	3.5	1.25	2.13
No. full-time faculty with responsibilities only to another department	.25	1	1.25
No. of full-time medical school and hospital personnel holding a joint appointment in your department and others	1	1	1
No. of part-time salaried personnel	2.5	1	1.75
No. of part-time nonsalaried personnel	4.5	1.5	3
Total no. persons in department	13.5	9	11.25

	Pathology		Microbiology		Total	
' your teaching staff adequate in number?	Yes 19	No 53	Yes 32	No 41	Yes 51	No 94
No. of additional teachers needed	112 or 2 per school		80 or 2 per school		192 or 2 per school	
Why do you not have the number needed?						
Salaries unavailable	28		33		61	
Personnel unavailable at salaries budgeted	28		12		40	
Personnel unavailable	14		4		18	
Why do you need more teachers?						
Divide teaching load	30		22		52	
To do a better job	42		37		79	
Increase research	45		27		72	
Other	10		5		15	
Subject matter						
Per cent taught by part-time teachers	25.5%		8.5%		17%	
Per cent taught by full-time teachers	74.5%		91.5%		83%	

TABLE 15

MINIMUM AND OPTIMUM PROFESSIONAL INCOME LEVELS NEEDED TO RECRUIT DESIRED TYPES OF TEACHERS

Opinions of department chairmen

(1) What would the *minimum* total professional income levels need to be in order to recruit the type of teachers you would desire?
(2) What are the *optimum* professional income levels for recruitment of the type of teacher desired, satisfaction in career and incentive for promotion?

A. Departments of pathology

Income level	Department head				Professor				Associate professor				Assistant professor				Instructor			
	Minimum		Optimum		Minimum		Optimum		Minimum		Optimum		Minimum		Optimum		Minimum		Optimum	
	T*	P*	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P
$20,000 or more	2	2	10	12	1		4	4	1		2	1								
18,000 - 19,999	2	3	11	7	1	2	6	3		1	1	4								
16,000 - 17,999	4	2	5	4		2	6	6		1	3	4			1					
14,000 - 15,999	11	15	7	6	6	7	9	8	1	2	9	11		1	2					
12,000 - 13,999	12	6	3	2	12	9	6	7	6	6	10	9		1	7	7		2		
10,000 - 11,999	5	5		2	11	10	3	4	12	11	7	4	7	4	12	10		1	3	2
8,000 - 9,999	1	1			4	3	1		12	9	3		12	12	8	11	2	3	8	10
6,000 - 7,999		1			1	1			5	5	1		16	12	6	4	14	10	18	15
Less than $6,000													2	4		1	19	19	6	6
Median amount in thousands of dollars	14.1	14.6	18.5	18.7	12.3	12.7	15.7	15.2	10.2	10.6	13.4	12.6	8.1	8.2	10.7	10.1	5.8	5.7	7.4	7.4
No. responding	37	35	36	33	36	34	35	32	37	35	36	33	37	34	36	33	35	33	37	33

*T—Tax supported schools
P—Privately supported schools

B. Departments of microbiology

Income level	Department head				Professor				Associate professor				Assistant professor				Instructor			
	Minimum		Optimum		Minimum		Optimum		Minimum		Optimum		Minimum		Optimum		Minimum		Optimum	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P
$20,000 or more			2	3				1												
18,000 - 19,999		2	2	1			1													
16,000 - 17,999	1		6	4		1	1	3												
14,000 - 15,999	1	3	5	9		2	5	4			1	3								
12,000 - 13,999	10	7	10	5	4	3	9	8		2	5	3			1	1				
10,000 - 11,999	10	7	8	7	6	8	13	11	3	3	7	8		1	4	5			1	
8,000 - 9,999	10	8	1	3	17	11	5	5	6	12	17	16	2	5	7	9			3	3
6,000 - 7,999	1	4			6	7	1		23	14	4	3	10	15	18	15	6	6	8	13
Less than $6,000	1				1				2	2			19	11	3	2	21	26	20	16
Median amount in thousands of dollars	11.0	11.0	13.6	14.2	9.2	9.6	11.8	12.0	7.3	8.1	9.5	9.7	5.6	6.7	7.5	7.9	5.3	5.2	5.6	6.0
No. responding	34	31	34	32	34	32	35	32	34	33	34	33	31	32	33	32	27	32	32	32

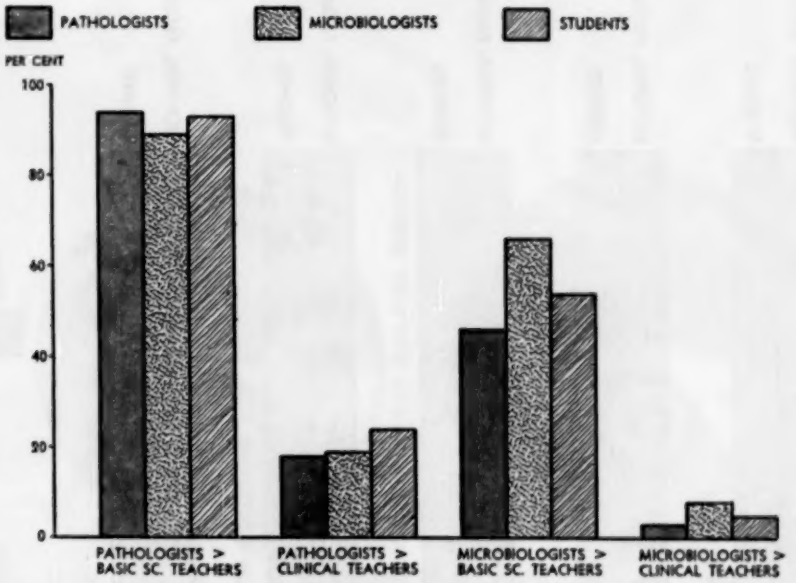

FIGURE 11. Judgment by students and by pathology and microbiology faculty members of the relative prestige of pathologists and microbiologists as compared with basic science and clinical teachers. (Percentages based on number of individuals responding to questions.)

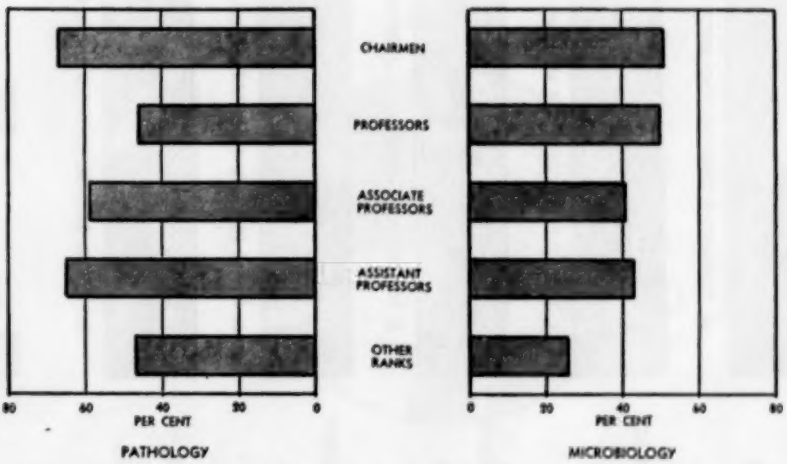

FIGURE 12. Per cent of faculty of various ranks who feel there is a shortage of teachers in their departments.

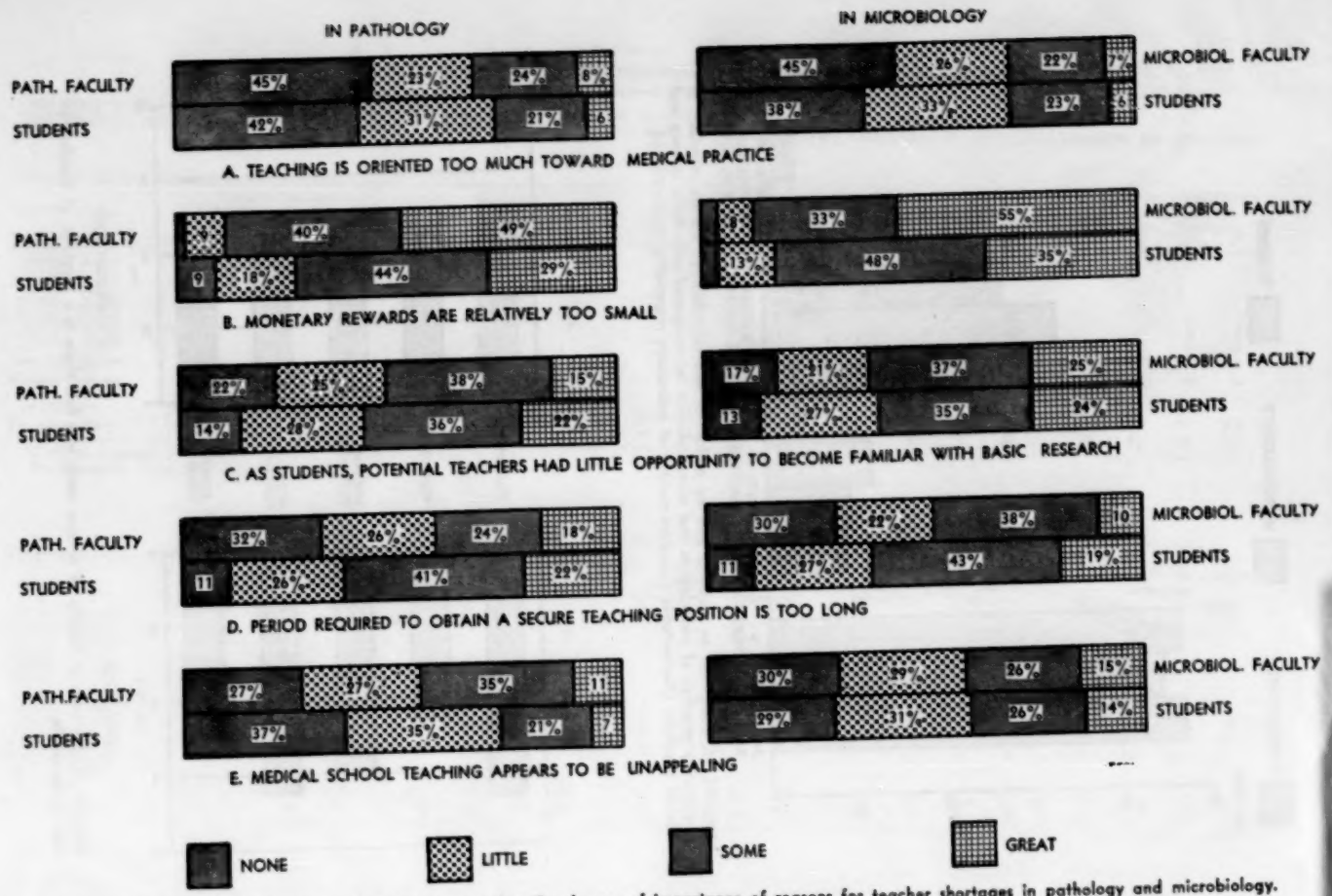

FIGURE 13. Opinions of faculty and students concerning the degree of importance of reasons for teacher shortages in pathology and microbiology.

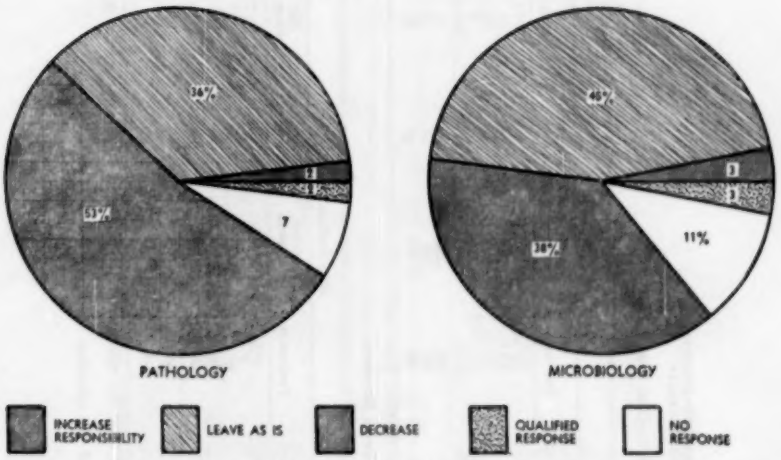

FIGURE 14. Faculty views of change in amount of responsibility for clinical teaching in order to increase attractiveness of the work to potential teachers.

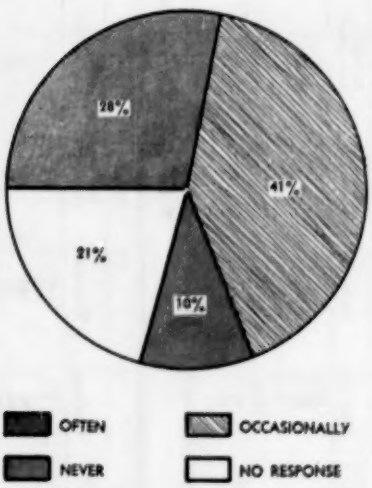

FIGURE 15. Frequency with which promotions are thought by pathology and microbiology faculty members to be based on research rather than on excellence in teaching.

TABLE 16

FACULTY RATINGS OF THE RELATIVE IMPORTANCE OF SELECTED REASONS FOR TEACHER SHORTAGES IN PATHOLOGY AND MICROBIOLOGY*

A. Teaching of students is oriented too much toward medical practice

Degree of importance	Pathology					Microbiology				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others
None	37%	38%	38%	46%	57%	39%	36%	48%	43%	57%
Little	26	12	15	23	32	32	29	21	25	24
Some	30	31	36	23	7	26	21	24	22	14
Great	7	19	11	6	4	3	14	7	10	5
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. responding**	43	16	47	70	44	31	14	29	40	21
Total no. in groups	of 61	of 37	of 76	of 107	of 86	of 65	of 26	of 58	of 89	of 81

B. Monetary rewards secured by teachers are relatively too small

Degree of importance	Pathology					Microbiology				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others
None	2%	6%	0%	1%	4%	8%	0%	3%	0%	9%
Little	7	0	2	16	13	3	7	10	10	9
Some	36	44	50	36	35	43	57	21	30	26
Great	55	50	48	47	48	46	36	66	60	56
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No responding	44	18	52	73	46	35	14	29	40	23
Total no. in groups	of 61	of 37	of 76	of 107	of 86	of 65	of 26	of 58	of 89	of 81

*Only the ratings of pathologists are tabulated on the reasons for shortages in pathology, and only the ratings of microbiologists on the reasons for shortages in microbiology.

**Percentages are computed on the basis of number of persons responding to each section of the question.

Table 16 (Continued)

C. Students have little opportunity to become familiar with basic research, and this is an essential ingredient in stimulating an interest in teaching

Degree of importance	Pathology					Microbiology				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others[1]
None	23%	18%	25%	17%	26%	12%	33%	17%	17%	17%
Little	34	38	25	23	17	35	20	17	12	22
Some	34	38	32	45	37	41	27	35	34	44
Great	9	6	18	15	20	12	20	31	37	17
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. responding	44	16	51	73	46	34	15	29	41	23
Total no. in groups	of 61	of 37	of 76	of 107	of 86	of 65	of 26	of 58	of 89	of 81

D. The period required to obtain a secure teaching position is too long

Degree of importance	Pathology					Microbiology				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others
None	32%	22%	30%	37%	30%	37%	43%	32%	28%	13%
Little	23	33	26	23	30	16	29	28	23	17
Some	19	28	32	19	25	31	28	29	41	61
Great	26	17	12	21	15	16	0	11	8	9
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. responding	43	18	50	73	44	32	14	28	39	23
Total no. in groups	of 61	of 37	of 76	of 107	of 86	of 65	of 26	of 58	of 89	of 81

Table 16 (Continued)

E. Medical school teaching appears to be unappealing

Degree of importance	Pathology					Microbiology*				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others
None	19%	24%	28%	27%	34%	27%	29%	42%	13%	50%
Little	19	35	35	32	17	27	43	17	40	18
Some	46	29	22	32	47	40	14	31	21	14
Great	16	12	15	9	2	6	14	10	26	18
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. responding	43	17	54	69	47	33	14	29	38	22
Total no. in groups	of 61	of 37	of 76	of 107	of 86	of 65	of 26	of 58	of 89	of 81

$\chi^2 = 22.94 \sim .02 < P < .05$

*Differences among faculty ranks are significant, but no direct relation between rank and response is discernible. Full professors and men holding "other" ranks tend to attribute less importance to this reason than do other groups.

F. Other reasons‡

Degree of importance	Pathology					Microbiology				
	Chairmen	Professors	Associate professors	Assistant professors	All others	Chairmen	Professors	Associate professors	Assistant professors	All others
No. responding	10	3	12	15	5	5	5	4	7	2

‡Only the number of suggested "other" reasons for teacher shortages is given. Other reasons suggested by pathologists include: lack of opportunity for research (7), too few positions available for potential staff (5), greater opportunity in other areas (4), arrangement of courses is not conducive to development of interest in teaching (4), lack of people with appropriate basic interests (3), loss of patient contact (3), the overburdened pathologist seen by the medical student makes the field unappealing (3). Other reasons suggested by microbiologists include: there is a shortage of capable people (3), lack of physical facilities (3), limited departmental budget (3), lack of departmental leadership and foresight (2), poor prestige, slow promotion, long training period, etc.

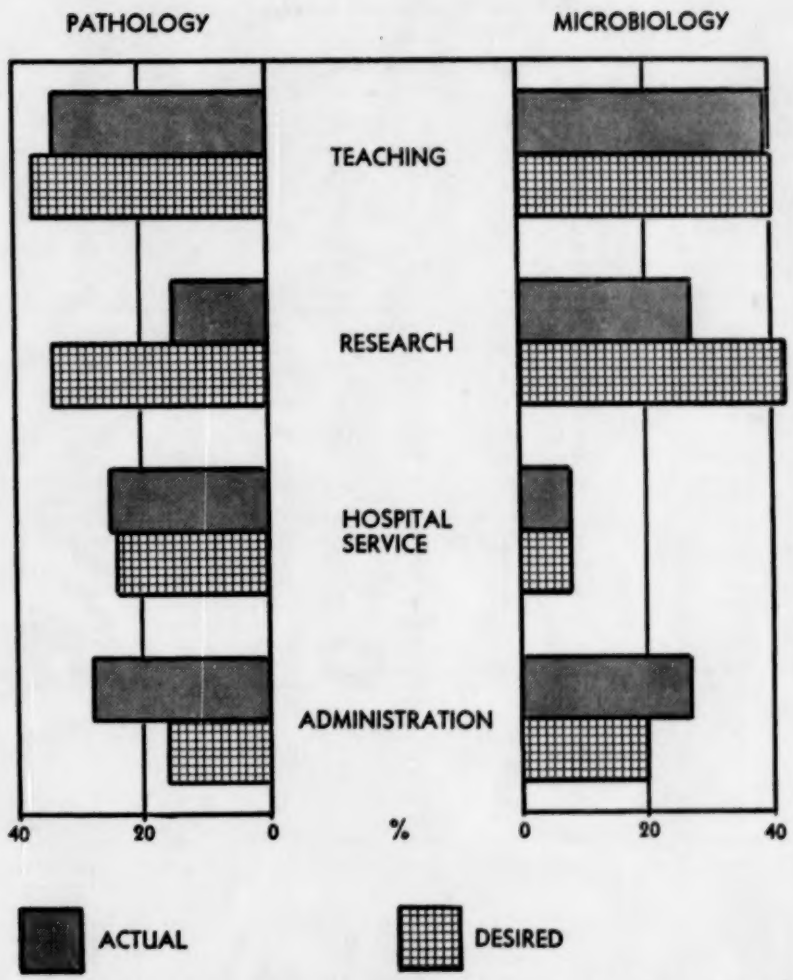

FIGURE 16. Median per cent of time department chairmen (a) actually spend and (b) prefer to spend in teaching, research, hospital service and administration.

TABLE 17

TIME SPENT BY FACULTY MEMBERS IN VARIOUS ACTIVITIES

I. Pathology

A. Chairmen

Proportion of time	Teaching		Research		Hospital service		Administration	
	Actual	Desired	Actual	Desired	Actual	Desired	Actual	Desired
0 - 19%	12%	7%	69%	11%	36%	31%	27%	66%
20 - 39%	53	55	27	61	42	65	41	32
40 - 59%	27	27	2	20	20	4	25	2
60 - 79%	5	7	2	8	0	0	7	0
80% or over	3	4	0	0	2	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(60)	(55)	(59)	(54)	(59)	(54)	(59)	(53)
Median per cent time*	34%	37%	15%	34%	25%	24%	28%	16%

B. Professors

0 - 19%	25%	17%	58%	13%	22%	28%	64%	87%
20 - 39%	36	59	31	47	42	48	14	10
40 - 59%	33	24	8	34	25	17	14	3
60 - 79%	6	0	3	3	11	7	5	0
80% or over	0	0	0	3	0	0	3	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(36)	(29)	(36)	(30)	(36)	(29)	(36)	(30)
Median per cent time	30%	30%	17%	35%	32%	26%	14%	10%

C. Associate professors

0 - 19%	12%	8%	54%	17%	21%	28%	68%	90%
20 - 39%	50	58	31	52	44	56	25	9
40 - 59%	33	31	8	22	26	14	7	1
60 - 79%	4	3	4	8	8	2	0	0
80% or over	1	0	3	1	1	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(76)	(72)	(76)	(72)	(76)	(71)	(76)	(71)
Median per cent time	35%	34%	19%	35%	34%	28%	13%	10%

D. Assistant professors

0 - 19%	18%	12%	60%	8%	18%	21%	81%	96%
20 - 39%	40	58	27	56	33	52	17	4
40 - 59%	33	26	8	25	33	25	2	0
60 - 79%	7	3	4	9	10	2	0	0
80% or over	2	1	1	2	6	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(106)	(98)	(103)	(98)	(104)	(96)	(103)	(95)
Median per cent time	36%	34%	16%	35%	39%	32%	11%	8%

E. Other ranks

0 - 19%	20%	11%	59%	21%	30%	33%	93%	97%
20 - 39%	43	56	19	42	18	29	5	1
40 - 59%	22	23	11	25	24	27	2	1
60 - 79%	11	4	6	8	20	10	0	1
80% or over	4	6	5	4	8	1	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(83)	(79)	(83)	(79)	(83)	(79)	(82)	(79)
Median per cent time	35%	33%	15%	33%	42%	34%	7%	6%

*Medians show that per cent of time above and below which 50% of respondents indicate they actually are and desire to be occupied in the various areas.

Table 17 (Continued)

II. Microbiology

A. Chairmen

Proportion of time	Teaching		Research		Hospital service		Administration	
	Actual	Desired	Actual	Desired	Actual	Desired	Actual	Desired
0 - 19%	6%	2%	31%	4%	90%	85%	28%	51%
20 - 39%	45	49	47	42	10	15	44	44
40 - 59%	30	45	20	45	0	0	17	5
60 - 79%	16	4	2	9	0	0	8	0
80% or over	3	0	0	0	0	0	3	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(64)	(55)	(64)	(55)	(63)	(54)	(64)	(55)
Median per cent time	39%	40%	27%	42%	8%	8%	27%	20%

B. Professors

0 - 19%	19%	13%	4%	0%	92%	91%	61%	78%
20 - 39%	31	35	38	35	8	9	35	13
40 - 59%	35	48	39	39	0	0	4	9
60 - 79%	11	4	15	17	0	0	0	0
80% or over	4	0	4	9	0	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(26)	(23)	(26)	(23)	(26)	(23)	(26)	(23)
Median per cent time	40%	41%	43%	47%	7%	8%	18%	14%

C. Associate professors

0 - 19%	2%	2%	10%	6%	90%	86%	79%	88%
20 - 39%	41	44	35	10	8	12	16	12
40 - 59%	31	46	36	57	2	2	5	0
60 - 79%	21	6	19	27	0	0	0	0
80% or over	5	2	0	0	0	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(58)	(52)	(58)	(51)	(58)	(51)	(58)	(51)
Median per cent time	45%	42%	44%	53%	7%	7%	12%	9%

D. Assistant professors

0 - 19%	3%	1%	11%	4%	92%	90%	90%	95%
20 - 39%	26	38	24	14	6	8	8	4
40 - 59%	43	53	38	50	2	2	2	1
60 - 79%	22	7	25	29	0	0	0	0
80% or over	6	1	2	3	0	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(89)	(72)	(87)	(72)	(89)	(72)	(89)	(72)
Median per cent time	51%	44%	50%	53%	6%	6%	7%	7%

E. Other ranks

0 - 19%	15%	11%	19%	6%	87%	94%	92%	94%
20 - 39%	31	37	24	11	5	5	4	5
40 - 59%	29	43	22	39	5	1	4	1
60 - 79%	20	8	21	35	3	0	0	0
80% or over	5	1	14	9	0	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%	100%
No. respondents	(79)	(65)	(80)	(66)	(78)	(64)	(79)	(64)
Median per cent time	45%	41%	49%	58%	7%	6%	7%	7%

TABLE 18

AREAS OF ACTIVITY IN WHICH ADDITIONAL ASSISTANCE WOULD BE OF GREATEST VALUE TO FACULTY*

Department and rank	Grading papers	Arranging equipment	Technicians who assist	Stenographic	Other**
Pathology					
Chairmen	8%	18%	31%	18%	26%
Professors	11	11	38	43	5
Associate professors	9	25	39	28	9
Assistant professors	9	22	40	34	10
Other ranks	6	17	43	17	2
Pathology total	8	20	39	27	10
Microbiology					
Chairmen	11%	22%	43%	18%	14%
Professors	4	8	35	15	4
Associate professors	10	26	59	22	3
Assistant professors	6	21	56	17	5
Other ranks	6	16	47	9	7
Microbiology total	8	20	50	16	7
Other departments					
All ranks	6%	31%	69%	8%	15%

* Percentages are based on number of persons of each faculty rank. Since many checked more than one area percentages add up to more than 100%.

For pathologists, differences among faculty ranks approach significance (between 5 and 10% level). Differences among microbiologists are clearly not significant.

** "Other" areas in which assistance is desired include: research and teaching assistants and fellows (18), technical assistance (15), administrative assistance (8), more staff (6), equipment (5).

TABLE 19

NUMBER OF HOURS PER YEAR DEVOTED TO VARIOUS ACTIVITIES BY FACULTY MEMBERS

A. Lectures, conferences or seminars

Department and rank	No.	Hours per year*									Total	Average hrs.**	Range of hours
		0–99	100–199	200–299	300–399	400–499	500–599	600–699	700–799	Over 800			
Pathology													
Chairmen	(52)	17%	27%	17%	17%	4%	8%	4%	2%	4%	100%	200	0–800
Professors	(30)	23	34	20	7	10	0	0	3	3	100	150	0–800
Associate professors	(68)	22	34	14	6	12	9	1	1	1	100	150	03–800
Assistant professors	(99)	15	29	18	15	5	8	4	3	3	100	200	10–1000
Other ranks	(79)	19	24	16	11	11	3	4	3	9	100	200	20–1400
Pathology total	(328)	19	29	17	12	8	6	3	2	4	100		
Microbiology													
Chairmen	(57)	47%	33%	9%	5%	2%	4%	0%	0%	0%	100%	100	08–500
Professors	(23)	44	30	9	13	0	4	0	0	0	100	100	30–500
Associate professors	(53)	38	36	13	9	2	2	0	0	0	100	100	10–500
Assistant professors	(83)	51	37	6	2	1	2	0	0	1	100	100	05–1000
Other ranks	(76)	49	29	10	4	5	3	0	0	0	100	100	20–550
Microbiology total	(292)	47	33	9	6	2	3	0	0	***	100		
Other departments													
All ranks	(13)	23%	31%	15%	23%	8%	0%	0%	0%	0%	100%	192	75–400

*Percentages are based on number of persons in each group who responded to each section of the question.
**Averages are medians and show the number of hours above and below which 50% of the respondents report.
***Less than 1%.

Table 19 (Continued)

B. Ward rounds

Department and rank	No.	Hours per year 0–99	100–199	200–299	300–399	Over 400	Total	Average hours	Range of hours
Pathology									
Chairmen	(45)	78%	22%	0%	0%	0%	100%	20	0–150
Professors	(27)	88	4	4	0	4	100	0	0–576
Associate professors	(60)	94	3	0	3	0	100	0	0–352
Assistant professors	(87)	86	7	5	1	1	100	10	0–400
Other ranks	(59)	91	2	2	3	2	100	0	0–1000
Pathology total	(278)	88	7	2	2	1	100		
Microbiology									
Chairmen	(39)	85%	13%	2%	0%	0%	100%	0	0–200
Professors	(18)	94	6	0	0	0	100	2	0–104
Associate professors	(41)	88	10	2	0	0	100	0	0–200
Assistant professors	(59)	95	5	0	0	0	100	0	0–150
Other ranks	(51)	88	10	2	0	0	100	0	0–288
Microbiology total	(208)	90	9	1	0	0	100		
Other departments									
All ranks		58%	17%	17%	8%	0%	100%	82	0–312

C. Meetings of professional societies

Department and rank	No.	Hours per year 0–99	100–199	200–299	300–399	Over 400	Total	Average hours	Range of hours
Pathology									
Chairmen	(53)	57%	28%	11%	4%	0%	100%	80	0–364
Professors	(29)	66	24	7	0	3	100	50	0–1780
Associate professors	(69)	67	25	7	1	0	100	60	01–300
Assistant professors	(98)	67	28	4	1	0	100	58	0–300
Other ranks	(75)	80	16	4	0	0	100	50	0–260
Pathology total	(324)	69	24	6	1	*	100		
Microbiology									
Chairmen	(54)	74%	18%	6%	2%	0%	100%	60	0–300
Professors	(21)	62	28	5	5	0	100	75	30–300
Associate professors	(51)	78	20	2	0	0	100	51	0–250
Assistant professors	(78)	83	17	0	0	0	100	50	0–150
Other ranks	(74)	86	14	0	0	0	100	40	0–144
Microbiology total	(278)	80	17	2	1	0	100		
Other departments									
All ranks	(13)	92%	8%	0%	0%	0%	100%	50	11–150

*Less than 1%.

TABLE 20

CLINICAL APPLICATIONS IN TEACHING PATHOLOGY AND MICROBIOLOGY

Replies from faculty

If emphasis on clinical applications is to be encouraged, how do you think it can best be attained? (See also Figure 17.)

Suggestions	Pathologists			Microbiologists		
	Number	Per cent		Number	Per cent	
(1) Present clinical problems and demonstrations; e.g., use case study method, or correlate pathology and microbiology with clinical signs, symptoms, etc.						
a. Specifically recommend using patients	(20)	8%		(3)	1%	
b. Specifically recommend not using patients and using only visual aids and fresh specimens	(7)	3	34	(7)	4	31
c. No mention of use of patients	(59)	23		(46)	26	
(2) Occasional attendance at ward rounds, CPC, seminars, or clinical sessions	(33)	13		(9)	5	
(3) Both of above	(8)	3		(2)	1	
(4) Cooperation between basic science and clinical departments	(39)	15		(43)	24	
(5) Clinical orientation of basic science teaching	(28)	11		(18)	10	
(6) Use of more (or only) basic science teachers with M.D. degree	(5)	2		(7)	4	
(7) Teachers should have clinical contacts and/or training	(6)	2		(7)	4	
(8) Have well trained and/or experienced teachers	(15)	6		(6)	3	
(9) By the instructor in his lectures and laboratory	(0)	0		(12)	7	
(10) Have more autopsy or correlation at autopsy	(11)	4		(0)	0	
(11) Other	(26)	10		(20)	11	
Total	(257)	100%		(179)	100%	
No response	(110)			(140)		

Typical specific responses:

Professor-chairman, pathology:

(1) Teaching by men having experience in and knowledge of clinical problems

(2) Carefully planned course with specific objectives

(3) Adoption of a comprehensive, functional concept of pathology

(4) Maintenance of continuous contact with clinical problems through participation in hospital service and other activities

(5) Routine clinico-pathologic conferences in all pathologic areas

(6) Projectional, correlative thinking and teaching

(7) Utilization of the *case method* in all teaching, thus emphasizing the fact that disease is a biological process affecting the *whole* person—not just a presumably isolated part of the person

Professor, pathology:

(1) By teaching clinical subjects, as physical diagnosis, and introductory medicine in first year

(2) By including history of disease in each pathology lecture

(3) By full clinical pathological correlation in each autopsy

(4) By selected ward rounds, and clinical case presentations, preferably by clinical staff

Instructor, pathology:

(1) Fewer students per instructor—most important

(2) More time allowed for pathology

(3) More appropriate basic science quizzing

Assistant professor, bacteriology:

By more correlative teaching curricula, by closer contact between teacher and student, by more emphasis on clinical occurrence and less taxonomic and formal view of subject. Reduce departmentalization which prevents discussion of allied phenomena which belong to other departments

Professor, bacteriology:

Speaking for microbiology: (1) *By example* of a good laboratory service in the teaching hospital properly supervised by a director of laboratories who is familiar with diagnostic microbiology. (2) By the clinical teachers' attitude toward microbiology; e.g., desirability of etiologic diagnosis

TABLE 21

BASIC SCIENCE ASPECTS IN TEACHING CLINICAL SUBJECTS

Replies from faculty

If emphasis upon basic science aspects in teaching is to be encouraged, how do you think it can best be attained? (See also Figure 17.)

Suggestions	Pathologists		Microbiologists	
	Number	Per cent	Number	Per cent
(1) Consider basic science aspects in each case or disease	(44)	17%	(46)	24%
(2) Have basic science representation in clinical conferences, seminars, courses	(75)	29	(40)	21
(3) Interdepartmental cooperation; integrate teaching and demonstration with basic science departments	(42)	17	(36)	19
(4) Have staff well versed in or oriented toward basic science	(29)	11	(27)	15
(5) Develop capable clinical staff	(11)	4	(10)	5
(6) Extend basic science teaching to third and fourth year, or have reviews and refreshers	(22)	9	(11)	6
(7) Shouldn't be needed if basic science training is good	(5)	2	(2)	1
(8) Other	(29)	11	(16)	9
Total	(257)	100%	(188)	100%
No response	(110)		(131)	

Typical specific responses:

Professor, pathology:

(1) Pathologist in attendance routinely at ward rounds and departmental conferences
(2) Students follow their cases through surgery, including surgical pathology, and death conference, and CPC, when applicable
(3) Clinicians with basic science training
(4) Teaching clinics on problem type cases, with all basic science departments represented

Professor-chairman, pathology:

By the department of pathology being accepted for what it is—not just a basic science subject but a bridging subject; by frequent consultation and seminar sessions with other departments, of the clinical years—by clinicians becoming less enamoured with the idea that chemistry and physiology are not all in medicine and by clinicians ceasing to think themselves capable of speaking authoritatively on pathology by simply parroting out of some book and making it perfectly apparent to all listeners that they have no knowledge of what they are saying

Associate professor, pathology:

(1) Emphasis upon pathogenesis—to include what is known of involved "systems and mechanisms" beginning with the first year students and expanding
(2) Reduction in authority of departmental heads to hold their respective departments aloof from integrative efforts; reduction in administrative authority by Ph.D.'s
(3) Basic research by clinical departments
(4) Broadening knowledge of all teachers in the scientific problems of other disciplines in their medical school
(5) Balanced emphasis between teaching, consultation and research
(6) Encouragement of the "inquisitive mind" for students and faculty

Assistant professor, pathology:

(1) Relate clinical aspects to general biological principles and phenomena
(2) Utilization of animal experiments including non-mammalian forms
(3) Emphasis on ontogenetic, phylogenetic and comparative anatomical principles
(4) Increased development of student research program over third and fourth year program, as an individual investigator and/or collaborator with faculty member
(5) Integrate clinical faculty members in basic science subjects to emphasize utilization of basic science principles in clinical work

Associate professor, pathology:

(1) By selection of clinical teachers who are aware that the "basic sciences" are indeed the foundations of clinical medicine
(2) By elective courses in the third and fourth years, in which advances in the basic sciences and further application of these sciences to clinical medicine are discussed or demonstrated.
(3) By conferences, on the order of clinico-pathologic conferences, in which qualified teachers of the basic sciences participate with clinical teachers. A prime requisite would be proper preparation and organization of the material.

(2) and (3) are decidedly secondary to (1). Ideally they would be unnecessary insofar as they are conceived of as methods of correcting deficiencies in the teaching by clinical departments.

Assistant professor, pathology and oncology:

(1) Systematic coverage by series of review seminars
(2) Research seminars
(3) Clinico-pathologic conferences
(4) Interdepartmental conferences, including basic science staff and clinicians

Associate professor, pathology:

Have strong conviction that medicine too vast to continue present teaching of disease subjects—would prefer an integrated program of approach to symptoms, signs, syndromes by analysis of possible basic derangements (i.e., functional, organic, anatomic, metabolic) that underlie such findings and then in last year or postgraduate level permit opportunity to organize concepts of specific disease entities.

Associate professor, pathology:

(1) Clinical teachers should have, or be engaged in research, or at least be familiar with some phase of basic research
(2) Students should be encouraged to engage

in clinical or basic research
(3) Joint teaching sessions of basic science and clinical departments
(4) Seminars of students, with participation of teachers, on fields of medicine in which current research is especially active and successful

Professor, pathology:

Clinical teachers well-versed in basic sciences should be in contact with first and second year students. The obliteration of departmental categories, except for clerical or administrative purposes, should be encouraged. The majority of faculty members have the necessary background and ability to teach in both basic science and clinical medicine. The present system of departmentalization tends to create separated, isolated, specialized small faculty groups. At present the teaching assignment of a faculty member is determined by his departmental designation rather than his special abilities. The increasing emphasis on multiple interdepartmental activities of faculty members is a step in the right direction at this university

Professor, bacteriology, hygiene and preventive medicine:

The physician has only one brief period in which to study basic science. The material involved is a tremendous amount to even cover, much less master or appreciate. For goodness sakes do not sell basic science short. The student chafes at it now. Sell him the opportunity to study basic science rather than the undesirability of spending time on such subjects.

Professor, bacteriology:

Emphasis on the basic science aspects is best obtained by enlisting the enthusiastic cooperation of the clinical staff in this regard. A liaison staff member from each of the basic sciences may help but the students are impressed by the attitude of the clinical men. In the case of bacteriology emphasis may be stimulated by requiring interns, residents and perhaps fourth year students to carry out simple bacteriology on some of their cases under the guidance of a member of the department of bacteriology.

FAVOR CLINICAL EMPHASIS IN 1ST & 2ND YEAR
FAVOR BASIC SCIENCE ASPECTS IN TEACHING CLINICAL SUBJECTS
PATHOLOGISTS
MICROBIOLOGISTS
OTHER DEPT'S.
100 80 60 40 20 0
0 20 40 60 80 100
PER CENT
PER CENT

FIGURE 17. Per cent of faculty who favor placing emphasis upon (a) clinical applications in teaching pathology and microbiology to first or second year students and (b) upon basic science aspects in teaching clinical subjects. (See also Tables 20 and 21.)

TABLE 22

FACULTY OPINION OF THE MOST APPROPRIATE DEPARTMENT TO SUPERVISE INSTRUCTION IN VARIOUS SUBJECT MATTER AREAS

A. Courses in general pathology, systemic pathology and microbiology

Subject and faculty group	Department under whose supervision course should be taught: Pathology	Microbiology	Clinical departments	Some combination	Total	Number‡
General pathology						
Pathologists	99%	0%	0%	1%	100%	(345)
Microbiologists	95	1	0	4	100	(246)
Other departments	100	0	0	0	100	(13)
Systemic pathology						
Pathologists	97	0	*	3	100	(342)
Microbiologists	95	0	*	5	100	(237)
Other departments	100	0	0	0	100	(13)
Bacteriology						
Pathologists	5	93	*	2	100	(328)
Microbiologists	1	96	0	3	100	(302)
Other departments	0	100	0	0	100	(13)
Immunology						
Pathologists	5	88	3	4	100	(328)
Microbiologists	1	97	0	2	100	(300)
Other departments	0	100	0	0	100	(13)
Virology						
Pathologists	5	90	1	4	100	(328)
Microbiologists	1	97	0	2	100	(301)
Other departments	0	100	0	0	100	(13)
Mycology						
Pathologists	6	86	2	6	100	(328)
Microbiologists	1	93	1	5	100	(300)
Other departments	0	100	0	0	100	(13)

‡Percentages on each section are based on the number of persons responding to that item.
*Less than 1%.

Table 22 (Continued)

B. Special pathology courses*

Subject and faculty group	Department under whose supervision courses should be taught: Pathology	Microbiology	Clinical departments	Pathology and clinical	Other combinations	Total	Number
Surgical							
Pathologists	88%	0%	5%	7%	*	100%	(340)
Microbiologists	69	0	19	12	0	100	(215)
Other departments	67	0	25	8	0	100	(12)
Obstetrics and gynecology							
Pathologists	80	0	10	10	0	100	(340)
Microbiologists	58	0	31	11	*	100	(210)
Other departments	59	0	33	8	0	100	(12)
Neurological							
Pathologists	75	0	15	10	0	100	(339)
Microbiologists	59	0	30	11	*	100	(209)
Other departments	59	0	33	8	0	100	(12)
Medical							
Pathologists	88	0	4	7	1	100	(333)
Microbiologists	68	0	21	10	1	100	(211)
Other departments	75	0	25	0	0	100	(12)

*The differences in distributions of responses made by pathologists and microbiologists are significant for each section of the above group of special pathology courses. In each case the χ^2 test is significant at beyond the .001 level of confidence.

Table 22 (Continued)

C. Clinical pathology courses*

Subject and faculty group	Department under whose supervision course should be taught: Pathology	Microbiology	Clinical department	Pathology and microbiology	Pathology and clinical	Microbiology and clinical	Pathology and microbiology and clinical	Total	Number
Hematology									
Pathologists	50%	2%	35%	*%	12%	1%	0%	100%	(325)
Microbiologists	35	2	53	1	7	*	2	100	(228)
Other departments	25	8	67	0	0	0	0	100	(12)
Serology									
Pathologists	40	34	15	4	5	2	*	100	(325)
Microbiologists	5	73	13	2	1	5	1	100	(265)
Other departments	23	46	31	0	0	0	0	100	(13)
Clinical chemistry									
Pathologists	53	4	34	1	8	0	*	100	(310)
Microbiologists	27	2	65	1	3	0	2	100	(185)
Other departments	25	8	67	0	0	0	0	100	(12)
Clinical bacteriology									
Pathologists	27	48	12	6	3	4	*	100	(326)
Microbiologists	1	73	14	2	1	8	1	100	(272)
Other departments	15	62	15	8	0	0	0	100	(13)
Clinical microscopy									
Pathologists	53	9	28	3	7	*	*	100	(321)
Microbiologists	31	14	44	3	5	1	2	100	(215)
Other departments	46	15	39	0	0	0	0	100	(13)

*The differences in distributions of responses made by pathologists and microbiologists are significant for each section of the above groups of clinical pathology courses. In each case the χ^2 test is significant beyond the .001 level of confidence.

TABLE 23

COMPOSITION OF STUDENT GROUP

In an attempt to obtain a random sample of approximately 10% of the sophomore and senior classes in each medical school, participants were asked to select, from alphabetical lists, every tenth name in the sophomore class and every tenth name in the senior class. They were also asked to select two interns, two residents, and two recent graduates. When the questionnaires were completed, participants were also asked to indicate, for sophomores and seniors, the student's comparative rank in his present class as upper, middle, or lower third.

A. Student group

Class	Type of institution: Tax-supported	Private	Total
Sophomores	363	360	723
Seniors	269	295	564
Interns	60	69	129
Residents	55	83	138
Recent graduates	38	52	90
Total	785	859	1644

B. Class standing of sophomores and seniors

Class	Third of class: Upper No.	Upper Per cent	Middle No.	Middle Per cent	Lower No.	Lower Per cent	Rank unknown No.	Rank unknown Per cent	Total No.	Total Per cent
Sophomores	271	37	239	33	165	23	48	7	723	100
Seniors	237	42	171	30	147	26	9	2	564	100

C. Sex of students

	No.
Male	1553
Female	91
	1644

D. Marital status of student group

Class	No.	Married Per cent	Single Per cent	Total Per cent
Sophomores	(723)	32	68	100
Seniors	(564)	58	42	100
Interns	(129)	67	33	100
Residents	(138)	64	36	100
Recent graduates	(90)	87	13	100

E. Number of children

Class	Number of children: 0	1	2	3	4 or more
Sophomores	622	64	21	9	2
Seniors	411	90	47	10	2
Interns	86	20	12	10	1
Residents	71	35	23	7	2
Recent graduates	16	13	32	25	4
Total	1206	222	135	61	11

TABLE 24

TOTAL DEBT AT TIME OF GRADUATION FROM MEDICAL SCHOOL

Amount of debt	Sophomores ‡		Seniors		Interns		Residents		Recent graduates	
	T*	P**	T	P	T	P	T	P	T	P
None	45%	55%	48%	36%	40%	66%	68%	70%	41%	76%
Less than $1,000	5	3	13	9	13	9	8	7	12	6
$1,000 to $3,000	19	16	16	15	24	11	10	19	33	10
$3,000 to $5,000	11	11	9	9	13	4	4	0	5	2
$5,000 to $7,000	11	9	7	5	5	4	4	2	4	4
$7,000 to $9,000	4	2	2	2	3	4	4	1	0	0
Over $9,000	5	4	5	4	2	2	2	1	5	2
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. students	(348)	(317)	(264)	(286)	(57)	(65)	(52)	(80)	(36)	(48)
Median debt of cases reporting some debt	$3,500	$3,400	$2,700	$2,700	$2,300	$2,300	$2,000	$1,900	$1,900	$2,300

‡Sophomores estimated amount of debt anticipated.
*State and municipal tax-supported schools.
**Private schools.

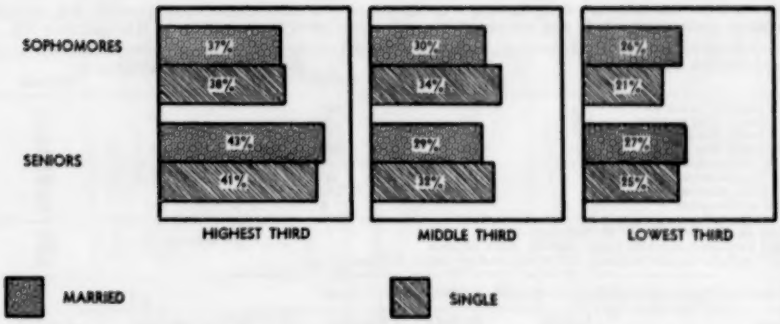

FIGURE 18. Per cent of married and single students achieving each third of class rank (rank not available for remaining percentages in each category).

TABLE 25

RELATIONSHIP BETWEEN MARITAL STATUS OF STUDENTS AND INTERFERENCE WITH STUDIES CAUSED BY FINANCIAL WORRY

Class and marital status	Interference with studies			Total	No. students
	Seriously	Occasionally	Not at all		
Sophomores					
Married	4%	50%	46%	100%	(229)
Single	2	38	60	100	(494)
Seniors					
Married	5	50	45	100	(326)
Single	1	39	60	100	(238)
Interns					
Married	6	42	52	100	(86)
Single	2	33	65	100	(43)
Residents					
Married	4	39	57	100	(89)
Single	0	18	82	100	(49)
Recent graduates					
Married	1	41	58	100	(78)
Single	0	50	50	100	(12)
Total group					
Married	4%	47%	49%	100%	(808)
Single	2%	37%	61%	100%	(836)

TABLE 26

PREPROFESSIONAL COLLEGE EDUCATION OF STUDENTS

A. What additional courses would you include if it were possible to start your college work again?

B. What courses would you exclude if it were possible to start your college work again?

The data for this table are derived from a tabulation of responses of all students from a 20% random sample of medical schools in and outside of the U.S. Total number of students in this sample = 347.

Course area (see below)	Number of recommendations to: Include	Exclude
(1) Biological sciences	165	114
(2) Commercial courses	32	0
(3) Foreign languages	37	49
(4) Humanities	266	25
(5) Mathematics	56	22
(6) Physical sciences	95	44
(7) Social sciences	193	33
(8) Miscellaneous	8	10
Would neither include nor exclude any courses		22
Would exclude none, but would include more courses		162
Would include no new courses, but would exclude some of those taken		33

Notable recommendations for specific subject matter areas:

Subject	Include	Exclude	Subject	Include	Exclude
Literature	67	5	Physical chemistry	28	7
History	61	3	Genetics	26	3
Philosophy	58	4	Statistics	16	0
English and writing	33	4	German	6	21
Economics	32	5	Comparative anatomy	3	16
Biochemistry	31	2	Botany	1	12

Course titles included under general headings:

(1) Biological sciences
- Anatomy
- Comparative anatomy
- Bacteriology-microbiology
- Biochemistry
- Biology
- Botany
- Embryology
- Endocrinology
- Genetics
- Histology
- Pharmacy
- Parasitology
- Physiology
- Zoology
- "Required premed"
- "Nonrequired premed"

(2) Commercial courses
- Business
- Typing and/or shorthand
- Commercial law

(3) Foreign languages
- German
- Greek
- Latin
- "Foreign language"

(4) Humanities
- Bible
- Comparative religion
- English
- English composition
- Fine arts
- "Humanities"
- Liberal arts
- Literature
- Music
- Philosophy
- Speech

(5) Mathematics
- Analytical geometry
- Calculus
- "Mathematics"
- Statistics
- Trigonometry

(6) Physical sciences
- Astronomy
- "Chemistry"
  - General
  - Organic
  - Physical
  - Qualitative
  - Quantitative
- Geology
- Physics

(7) Social sciences
- Anthropology
- Archaeology
- Economics
- Education
- Geography
- History
- Political science
- Psychology
- Sociology
- "Social science"

(8) Miscellaneous
- Engineering
- R.O.T.C.
- Other

TABLE 27

STUDENTS' UNDERGRADUATE MAJOR FIELDS OF STUDY

Subject matter areas	Sophomores		Seniors		Interns		Residents		Recent graduates		Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Biological sciences	402	58	343	63	70	60	87	68	50	62	952	61
Education	1	0	1	0	0	0	1	1	1	1	4	0
Humanities	26	4	17	3	4	3	7	5	3	3	57	3
Mathematics	5	1	8	1	5	4	5	4	0	0	23	1
Social sciences	32	4	28	5	4	3	0	0	3	3	67	4
Physical sciences	240	34	148	27	37	31	34	26	24	30	483	30
Other	28	4	31	6	6	5	5	4	3	3	73	
No. majors reported	734	105*	576	105*	126	106*	139	108*	84	102*	1659	103*
Total number students	(691)		(540)		(117)		(128)		(81)		(1557)	

*Percentages are based on the number of respondents in each class rather than on the number of responses. Since several people reported double majors, total percentages add to over 100.

Note: The proportions of scholastically high, middle, and low ranking students do not vary within the subject-matter categories.

TABLE 28

STUDENTS' UNDERGRADUATE MINOR FIELDS OF STUDY

Subject matter areas	Sophomores		Seniors		Interns		Residents		Recent graduates		Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Biological sciences	180	28	131	26	30	26	26	22	18	25	385	26
Education	8	1	13	2	2	2	5	4	1	1	29	2
Humanities	92	14	77	15	21	18	16	13	9	12	215	14
Mathematics	58	8	53	10	17	15	15	12	9	12	151	10
Social sciences	76	12	61	12	14	12	13	11	9	12	173	11
Physical sciences	245	37	201	40	42	37	42	36	26	35	556	38
Other	54	8	25	5	4	3	10	8	5	6	98	6
No. minors reported	713	108*	560	110*	130	113*	127	106*	77	103*	1607	107*
Total number students	(646)		(500)		(113)		(116)		(73)		(1448)	

*Percentages are based on the number of respondents in each class rather than on the number of responses. Since several people reported double minors, total percentages add to over 100.

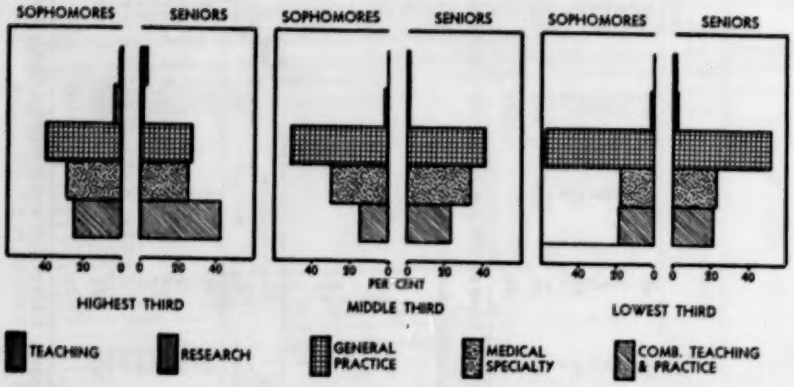

FIGURE 19. Percentage of high, middle and low achievement students expressing interest in various areas of professional activity.

TABLE 29

MEDIAN INTEREST RANKS OF TWELVE AREAS OF STUDY*

Replies from students

Area of study	Median	No. ranks assigned
(1) Medicine and medical specialties	1.5	1174
(2) Surgery and surgical specialties	3.7	1044
(3) Pathology (incl. clinical pathology)	3.8	1534
(4) Obstetrics and gynecology	4.4	1040
(5) Pediatrics	4.4	1010
(6) Physiology	4.4	1527
(7) Pharmacology	6.3	1483
(8) Psychiatry	6.5	1273
(9) Microbiology	7.0	1473
(10) Biochemistry	7.0	1499
(11) Anatomy	7.0	1515
(12) Preventive medicine and public health	8.6	1194

*The medians are based on the total number of persons who assigned a rank to each given area of study. They show the level above and below which 50% of the respondents ranked each area. The lowest median numerically indicates the highest overall rank. For more detailed breakdown of responses to this question see Figure 20.

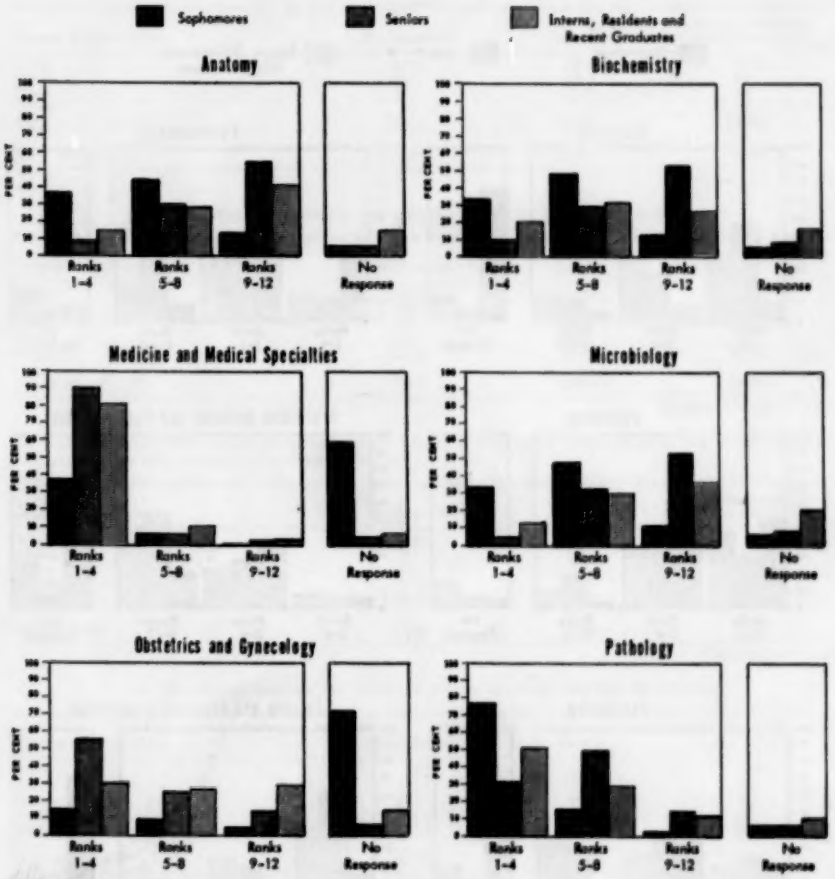

FIGURE 20. Medical student interest in areas of study. Information on which these graphs are based was obtained by requesting medical students to rank, in order of their preference, 12 areas of study. The distribution of ranks received is shown for each area separately. Example: 37 per cent of sophomores ranked anatomy first, second, third or fourth among their preferences; 45 per cent of sophomores ranked it fifth through eighth, etc. (See also Table 29.)

FIGURE 20 (Cont'd)

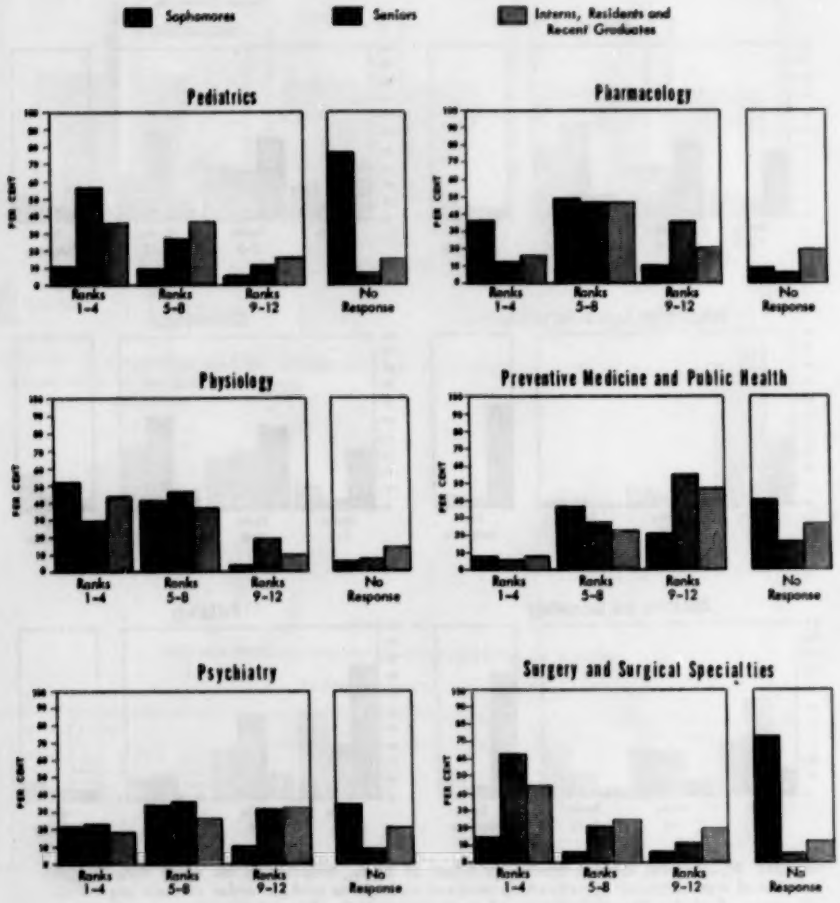

TABLE 30

STUDENT OPINION OF RELATIVE IMPORTANCE OF SELECTED REASONS FOR TEACHER SHORTAGES IN PATHOLOGY*

A. Teaching of students is oriented too much toward medical practice

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	46%	43%	37%
Little	28	33	31
Some	20	17	26
Great	6	7	6
Total	100%	100%	100%
No. students	(708)	(558)	(350)

$\chi^2 = 14.19 \sim .02 < P < .05$

B. Monetary rewards secured by teachers are relatively too small

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	9%	9%	7%
Little	18	19	17
Some	48	44	40
Great	25	28	36
Total	100%	100%	100%
No. students	(680)	(542)	(346)

$\chi^2 = 14.11 \sim .02 < P < .05$

C. Students have little opportunity to become familiar with basic research, and this is an essential ingredient in stimulating an interest in teaching

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	16%	14%	9%
Little	30	29	24
Some	35	34	40
Great	19	23	27
Total	100%	100%	100%
No. students	(709)	(558)	(353)

$\chi^2 = 19.11 \sim P < .01$

D. The period required to obtain a secure teaching position is too long

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	8%	13%	12%
Little	25	27	28
Some	43	41	40
Great	24	19	20
Total	100%	100%	100%
No. students	(695)	(547)	(343)

$\chi^2 = 11.81 \sim .05 < P < .10$

E. Medical school teaching appears to be unappealing

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	38%	39%	29%
Little	37	34	33
Some	19	19	30
Great	6	8	8
Total	100%	100%	100%
No. students	(701)	(552)	(346)

$\chi^2 = 23.39 \sim P < .001$

*Though differences among student groups appear to be small, they are probably not chance differences. Note that χ^2 is significant for each of the suggested reasons for teacher shortages except for reason "D." The source of differences among groups is to be found in a consistent tendency for upperclassmen, particularly interns, residents and recent graduates, to attribute greater importance to the reasons for shortages.

TABLE 31

STUDENT OPINION OF RELATIVE IMPORTANCE OF SELECTED REASONS FOR TEACHER SHORTAGES IN MICROBIOLOGY*

A. Teaching of students is oriented too much towards medical practice

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	39%	39%	36%
Little	31	33	33
Some	24	22	25
Great	6	6	6
Total	100%	100%	100%
No. students	(701)	(558)	(346)

$\chi^2 = 2.22 \sim .80 < P < .90$

B. Monetary rewards secured by teachers are relatively too small

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	6%	3%	3%
Little	15	10	12
Some	50	49	42
Great	29	38	43
Total	100%	100%	100%
No. students	(679)	(541)	(343)

$\chi^2 = 25.49 \sim P < .001$

C. Students have little opportunity to become familiar with basic research, and this is an essential ingredient in stimulating an interest in teaching

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	15%	13%	8%
Little	28	27	25
Some	37	35	37
Great	20	25	30
Total	100%	100%	100%
No. students	(701)	(558)	(350)

$\chi^2 = 18.53 \sim P < .01$

D. The period required to obtain a secure teaching position is too long

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	10%	11%	12%
Little	26	27	29
Some	45	42	41
Great	19	20	18
Total	100%	100%	100%
No. students	(687)	(547)	(339)

$\chi^2 = 4.07 \sim .50 < P < .70$

E. Medical school teaching appears to be unappealing

Degree of importance	Sophomores	Seniors	Interns, residents, recent graduates
None	29%	29%	26%
Little	34	29	30
Some	23	27	32
Great	14	15	12
Total	100%	100%	100%
No. students	(701)	(558)	(346)

$\chi^2 = 14.11 \sim .02 < P < .05$

*The student groups do not vary with regard to the relative importance attributed to reasons "A" and "D." They do vary in the degree of importance attributed to reasons "B," "C" and "E." Again, differences arise from the tendency for upperclassmen to attribute greater importance to the given factors.

TABLE 32

THE WEEK OF THE MEDICAL SCHOOL SOPHOMORE

In a typical week, how many hours do you *actually* spend in each of the following activities? How many hours would you like to spend (*optimum*)?

Hours per week	Class and laboratory		Study		Research and electives		Work for money		Travel to and from school	
	Act.	Opt.	Act.	Opt.	Act.	Opt.	Act.	Opt.	Act.	Opt.
55+	0%*	0%	1%	2%	0%	0%	0%	0%	0%	0%
50 - 54	0	0	1	3	0	0	0	0	0	0
45 - 49	2	1	2	4	0	0	0	0	0	0
40 - 44	16	11	7	13	0	0	0	0	0	0
35 - 39	45	30	13	14	0	0	1	0	0	0
30 - 34	30	40	17	23	0	0	1	1	0	0
25 - 29	6	13	18	16	0	1	1	0	0	0
20 - 24	1	4	23	19	0	2	3	2	0	0
15 - 19	0	0	9	4	1	3	7	4	2	0
10 - 14	0	0	7	2	4	17	7	9	6	1
5 - 9	0	0	1	0	8	32	8	8	29	15
0 - 4	0	1	1	0	87	45	72	76	63	84
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. students	(715)	(648)	(718)	(657)	(625)	(584)	(602)	(535)	(687)	(587)

Hours per week	Meals		Sleep		Necessary routine		Recreation		Other**	
	Act.	Opt.	Act.	Opt.	Act.	Opt.	Act.	Opt.	Act.	Opt.
55+	0%	0%	27%	62%	0%	0%	1%	1%	0%	0%
50 - 54	0	0	21	16	0	0	0	0	0	0
45 - 49	0	0	35	16	0	0	0	0	0	0
40 - 44	0	0	12	4	0	0	1	1	0	0
35 - 39	0	0	3	0	1	1	2	1	2	1
30 - 34	0	0	0	0	2	1	4	4	3	0
25 - 29	2	1	0	0	2	1	5	5	2	2
20 - 24	14	14	0	0	6	6	14	16	6	4
15 - 19	19	21	0	0	16	11	17	21	9	7
10 - 14	43	42	0	0	32	33	25	30	20	16
5 - 9	15	14	2	2	29	31	23	17	27	31
0 - 4	7	8	0	0	12	16	8	4	31	39
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No. students	(713)	(623)	(716)	(646)	(710)	(623)	(706)	(624)	(248)	(197)

*Varying numbers of students responded to each part of this question. In order to obtain comparability between actual and optimal number of hours, per cents are based on number of respondents to each section rather than on total number of sophomores.

**"Other" activities listed frequently include: church, reading, household activities, social activities and "wasted" time.

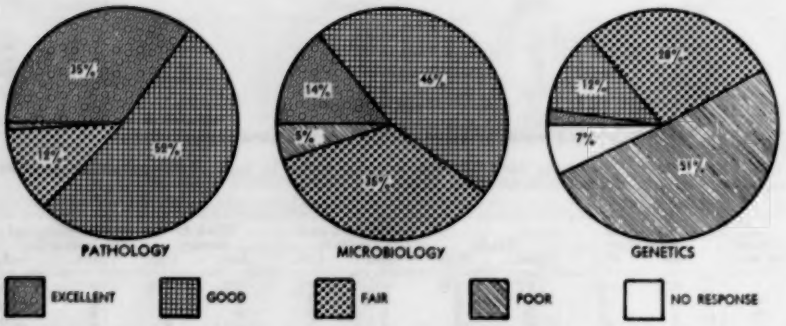

FIGURE 21. Percentage distributions of student evaluations of their overall educational experience and qualifications in pathology, microbiology and genetics.

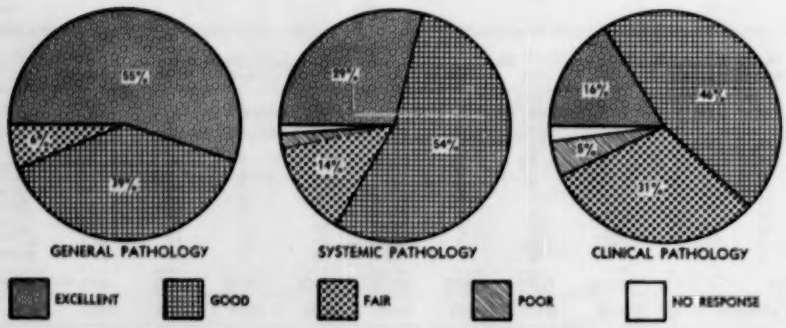

FIGURE 22. Percentage distributions of student ratings of adequacy of education in terms of achieving understanding of problems in pathology.

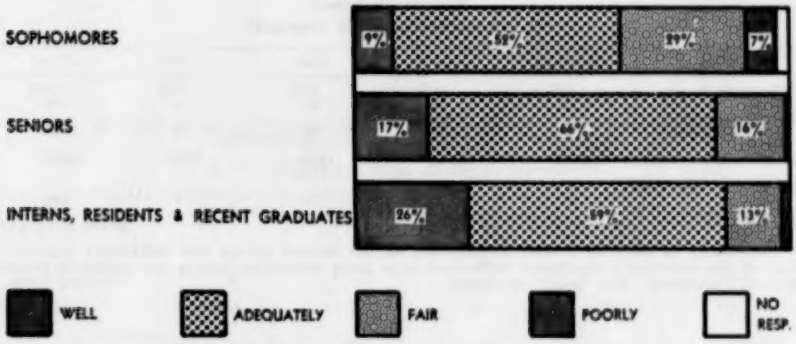

FIGURE 23. Percentage distributions of students' evaluations of their ability to correlate autopsy findings with clinical manifestations of the patient.

TABLE 33

STUDENT EVALUATION OF ADEQUACY OF EDUCATION IN TERMS OF ACHIEVING UNDERSTANDING OF PROBLEMS IN MICROBIOLOGY‡

A. Immunology related to hypersensitive states*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	22%	46%	25%	7%	100%
Seniors	15	46	34	5	100
Interns, residents, recent graduates	13	41	39	7	100
No. students	(295)	(732)	(510)	(105)	(1642)
Per cent of combined groups	18	45	31	6	100

$X^2 = 35.79 \sim P < .001$

‡There are no differences among high, middle and low ranking students in their evaluation of adequacy of education in microbiology.

*Distributions of the responses of the three student groups vary significantly. The number of sophomores who rate their training as "excellent" is disproportionately large, and the number who rate their training as "fair" is disproportionately small, as compared with the other student groups. It is these two ratings that make the principal contribution to the significant differences.

B. Mechanisms whereby bacteria produce disease*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	23%	55%	19%	3%	100%
Seniors	22	52	24	2	100
Interns, residents, recent graduates	23	49	25	3	100
No. students	(372)	(868)	(359)	(44)	(1643)
Per cent of combined groups	23	52	22	3	100

$X^2 = 7.51 \sim .20 < P < .3$

*Differences among responses of the three student groups could have arisen by the operation of chance factors.

Table 33 (Continued)

C. Information useful in diagnosis*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	13%	41%	35%	11%	100%
Seniors	19	51	25	5	100
Interns, residents, recent graduates	22	56	18	4	100
No. students	(278)	(787)	(456)	(119)	(1640)
Per cent of combined groups	17	48	28	7	100

$\chi^2 = 81.28 \sim P < .001$

*Differences in the distributions of responses of the student groups are statistically significant. Most of the statistically significant differences arise from differences among the groups in proportions of "excellent" and "poor" responses.

D. Information useful in management of patients*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	4%	24%	43%	29%	100%
Seniors	15	45	30	10	100
Interns, residents, recent graduates	18	48	27	7	100
No. students	(178)	(595)	(570)	(294)	(1637)
Per cent of combined groups	11	36	35	18	100

$\chi^2 = 231.16 \sim P < .001$

*Differences among student groups are significant and arise from differences between theoretically expected and actual frequencies in nearly all response categories.

E. Information useful in prevention of infectious diseases*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	13%	50%	31%	6%	100%
Seniors	15	46	32	7	100
Interns, residents, recent graduates	13	45	36	6	100
No. students	(225)	(772)	(537)	(105)	(1639)
Per cent of combined groups	14	47	33	6	100

$\chi^2 = 4.96 \sim .70 < P < .50$

*Differences among responses of the three student groups could have arisen through the operation of chance factors.

F. Bodily mechanisms for resisting infectious diseases*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	27%	52%	18%	3%	100%
Seniors	20	55	22	3	100
Interns, residents, recent graduates	16	56	24	4	100
No. students	(362)	(891)	(338)	(52)	(1643)
Per cent of combined groups	22	54	21	3	100

$\chi^2 = 23.4 \sim P < .001$

*Distribution of the responses of the three student groups varies significantly. The number of sophomores who rate their training as "excellent" is disproportionately large and the number of interns, residents and recent graduates who rate their training as "excellent" disproportionately small.

TABLE 34

STUDENT EVALUATION OF ADEQUACY OF EDUCATION IN TERMS OF ACHIEVING UNDERSTANDING OF PROBLEMS IN GENETICS**

A. The recognition of a disease as hereditary*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	7%	35%	42%	16%	100%
Seniors	9	34	44	13	100
Interns, residents, recent graduates	6	37	43	14	100
No. students	(120)	(554)	(661)	(227)	(1562)
Per cent of combined groups	7	36	42	15	100

$\chi^2 = 7.64 \sim .20 < P < .30$

**Analysis of data for all sections of this table showed no differences among high, middle and low ranking students. Differences among sophomores, seniors, and interns, residents and recent graduates are significant for all sections except "A." In sections "B," "D," "E" and "F," the source of the differences among these groups is the same. As level of medical school education increases there is a distinct tendency toward lower evaluation of adequacy of training in these areas.

*Differences among student groups may be attributed to chance factors.

B. The recognition of the transmission of an hereditary disease as dominant, recessive or sex-linked

Class	Excellent	Good	Fair	Poor	Total
Sophomores	12%	27%	34%	27%	100%
Seniors	7	25	38	30	100
Interns, residents, recent graduates	6	23	37	34	100
No. students	(136)	(402)	(557)	(466)	(1561)
Per cent of combined groups	9	25	36	30	100

$\chi^2 = 17.22 \sim P < .01$

C. The obtaining of accurate pedigree data when taking histories*

Class	Excellent	Good	Fair	Poor	Total
Sophomores	4%	19%	31%	46%	100%
Seniors	5	23	34	38	100
Interns, residents, recent graduates	3	22	40	35	100
No. students	(73)	(332)	(526)	(622)	(1553)
Per cent of combined groups	4	21	34	41	100

$\chi^2 = 14.44 \sim .02 < P < .05$

*Differences among groups are slight though significant. Interns, residents and recent graduates tend to feel more inadequate, and seniors to feel less inadequate than sophomores in this area.

Table 34 (Continued)

D. The fundamentals of gene action

Class	Excellent	Good	Fair	Poor	Total
Sophomores	7%	22%	38%	33%	100%
Seniors	5	16	37	42	100
Interns, residents, recent graduates	3	16	29	52	100
No. students	(94)	(297)	(534)	(624)	(1549)
Per cent of combined groups	6	19	34	41	100

$X^2 = 40.71 \sim P < .001$

E. The increasing importance of hereditary diseases in modern society

Class	Excellent	Good	Fair	Poor	Total
Sophomores	6%	26%	37%	31%	100%
Seniors	6	24	44	26	100
Interns, residents, recent graduates	4	21	43	32	100
No. students	(92)	(376)	(623)	(464)	(1555)
Per cent of combined groups	6	24	41	29	100

$X^2 = 12.60 \sim .02 < P < .05$

F. Genetic counseling

Class	Excellent	Good	Fair	Poor	Total
Sophomores	2%	8%	25%	65%	100%
Seniors	1	6	30	63	100
Interns, residents, recent graduates	0	8	25	67	100
No. students	(20)	(127)	(417)	(988)	(1552)
Per cent of combined groups	1	9	27	63	100

$X^2 = 40.71 \sim P < .001$

TABLE 35

EVALUATION OF COURSES†

Rate the following in terms of their value in helping you to learn the subject matter of pathology and microbiology. Check one of the four blanks for each subject, the last blank implying insufficient experience to enable you to make an evaluation.

A. Lectures

	Pathology			Microbiology		
Evaluation	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	58%	64%	60%	50%	56%	50%
Some value	31	29	34	32	35	43
Little value	9	7	6	9	9	7
Insufficient experience	2	0	0	0	0	0
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(564)	(353)	(723)	(564)	(357)

B. Laboratory

	Pathology*			Microbiology*		
Evaluation	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	54%	70%	73%	38%	52%	64%
Some value	38	27	22	47	40	30
Little value	7	3	4	15	8	6
Insufficient experience	1	0	1	0	0	0
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(564)	(353)	(723)	(558)	(357)
	$\chi^2 = 52.83 \sim P < .001$			$\chi^2 = 35.14 \sim P < .001$		

*Differences among student groups are significant. To conserve space, only those statistics which exceed the 5% level of confidence are reported.

C. Textbooks

	Pathology*			Microbiology		
Evaluation	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	66%	56%	61%	41%	39%	43%
Some value	28	40	36	39	47	46
Little value	6	4	3	19	14	10
Insufficient experience	0	0	0	1	0	1
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(564)	(357)	(723)	(558)	(357)
	$\chi^2 = 25.26 \sim P < .001$					

*Differences among student groups are significant.

D. General reading

	Pathology			Microbiology		
Evaluation	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	18%	17%	22%	12%	12%	17%
Some value	48	56	56	40	49	48
Little value	17	21	18	27	30	27
Insufficient experience	17	6	4	21	9	8
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(558)	(353)	(723)	(558)	(353)

E. Informal group discussions with staff

	Pathology			Microbiology		
Evaluation	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	40%	51%	53%	21%	33%	42%
Some value	25	28	29	26	29	28
Little value	8	8	8	15	17	13
Insufficient experience	27	13	10	38	21	17
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(564)	(353)	(723)	(564)	(353)

†No significant differences were found among the responses of high, middle and low achieving students. This breakdown is therefore not shown.

Table 35 (Continued)

F. Seminars and conferences

Evaluation	Pathology*			Microbiology*		
	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	22%	37%	38%	10%	22%	24%
Some value	24	35	36	16	25	29
Little value	11	10	9	15	17	15
Insufficient experience	43	18	17	59	36	32
Total	100%	100%	100%	100%	100%	100%
No. students	(716)	(558)	(357)	(716)	(558)	(350)
	$\chi^2 = 12.13 \sim .01 < P < .02$			$\chi^2 = 13.14 \sim .01 < P < .02$		

G. Oral reports

Evaluation	Pathology*			Microbiology		
	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	8%	8%	13%	4%	4%	7%
Some value	13	23	30	7	18	27
Little value	14	26	26	16	26	30
Insufficient experience	65	43	31	73	52	36
Total	100%	100%	100%	100%	100%	100%
No. students	(716)	(558)	(353)	(716)	(558)	(353)
	$\chi^2 = 9.59 \sim .02 < P < .05$					

H. Term papers

Evaluation	Pathology			Microbiology		
	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	4%	5%	4%	2%	3%	3%
Some value	8	14	22	8	12	18
Little value	17	28	40	19	30	41
Insufficient experience	71	53	34	71	55	38
Total	100%	100%	100%	100%	100%	100%
No. students	(716)	(558)	(353)	(716)	(558)	(353)

I. Examinations

Evaluation	Pathology*			Microbiology		
	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	26%	19%	18%	21%	17%	18%
Some value	49	49	52	49	49	49
Little value	23	31	29	29	33	31
Insufficient experience	2	1	1	1	1	2
Total	100%	100%	100%	100%	100%	100%
No. students	(723)	(564)	(353)	(723)	(558)	(357)
	$\chi^2 = 17.11 \sim P < .01$					

J. Motion pictures

Evaluation	Pathology			Microbiology		
	Soph.	Sr.	Int-Res-R.G.	Soph.	Sr.	Int-Res-R.G.
Great value	13%	16%	16%	17%	17%	18%
Some value	22	28	29	30	27	26
Little value	10	16	22	13	18	19
Insufficient experience	55	40	33	40	38	37
Total	100%	100%	100%	100%	100%	100%
No. students	(716)	(558)	(350)	(723)	(564)	(353)

*Differences among student groups are significant.

TABLE 36

STUDENT OPINION CONCERNING INFORMAL CONFERENCES

Do you believe that informal conferences with the staff outside classes would be of great value?

	No. students	*Per cent*
Yes	1208	75
No	418	25
Total	1626	100%

If yes, what would be accomplished?*

Increased understanding and clarification	75%
Stimulation of interest in course work	10
Extension of limits of knowledge	5
Other	10
Total	100%
No. students	(1148)

*These were free-answer questions. The replies have been categorized and tabulated; percentages are based on numbers of persons responding.

How should the staff for such informal conferences be selected?

Staff should be selected on the basis of possession of specific personal or professional qualities such as ability, interest, enthusiasm, understanding, proficiency, etc.	49%
By the department or staff involved	18
By students	12
All staff should participate	10
Voluntary participation by staff	7
Other	4
Total	100%
No. students	(1126)

How much time should be devoted to such informal conferences?

Less than one hour per week	7%
One to two hours per week	30
Two to three hours per week	19
More than three hours per week	28
Other time division, e.g., 10% of class time, etc.	16
Total	100%
No. students	(1123)

TABLE 37

EFFECT OF EXAMINATIONS ON STUDENTS

A. Pathology*

Have examinations led you to:	Sophomores				Seniors				Int. Res. R.G.	All students
	High	Mid.	Low	No rank	High	Mid.	Low	No rank		
(1) Memorize, and forget later?	30%**	30%	32%	27%	39%	38%	42%	44%	41%	36%
(2) Read and study less widely in the field?	37	41	34	33	35	29	44	44	30	35
(3) Concentrate unduly on lecture notes?	39	34	31	29	49	44	42	44	47	41
(4) Feel undue competition with classmates?	18	15	22	12	18	24	27	22	21	20
(5) Feel resentful of certain faculty members?	8	11	13	6	10	12	17	11	11	11
(6) Feel too nervous to think straight?	12	12	20	6	8	10	26	11	9	12
No. students	(271)	(239)	(165)	(48)	(237)	(171)	(147)	(9)	(357)	(1644)
Average no. of "effects" checked	1.4	1.4	1.5	1.2	1.6	1.6	2.0	1.8	1.6	1.6

Among classes: $\chi^2 = 23.84 \sim P < .01$
Among sophomore achievement levels: $\chi^2 = 13.49 \sim .10 < P < .20$
Among senior achievement levels: $\chi^2 = 25.61 \sim P < .01$

*Differences among classes are significant, as are differences among achievement levels within the senior class. This indicates that the kinds of problems engendered by examinations change with level of training, and that they vary for good and poor achievers, at least at the more advanced levels. Differences among various sophomore achievement levels could have arisen by chance.

**Students were asked to check as many of the effects as applied. The percentages given are based on number of students in each class and at each level. Since in most cases more than one effect was checked, percentages add to more than 100%.

Table 37 (Continued)

B. Microbiology*

Have examinations led you to:	Sophomores				Seniors				Int. Res. R.G.	All students
	High	Mid.	Low	No rank	High	Mid.	Low	No rank		
(1) Memorize, and forget later?	63%	66%	79%	54%	76%	74%	73%	78%	62%	69%
(2) Read and study less widely in the field?	44	46	41	42	43	36	46	44	34	41
(3) Concentrate unduly on lecture notes?	57	58	58	50	62	58	59	67	57	41
(4) Feel undue competition with classmates?	18	19	22	15	20	26	26	22	21	21
(5) Feel resentful of certain faculty members?	17	21	19	19	18	16	20	0	12	19
(6) Feel too nervous to think straight?	10	11	19	4	7	10	21	0	9	14
No. students	(271)	(239)	(165)	(48)	(237)	(171)	(147)	(9)	(357)	(1644)
Average no. of "effects" checked	2.1	2.2	2.4	1.8	2.3	2.2	2.4	2.1	1.9	2.2

Among classes: $\chi^2 = 13.41 \sim .20 < P < .30$
Among sophomore achievement levels: $\chi^2 = 10.28 \sim .30 < P < .50$
Among senior achievement levels: $\chi^2 = 17.79 \sim .05 < P < .10$

*Differences among classes and among achievement levels within classes could have arisen by chance.

TABLE 38

RANKS OF STUDENT PREFERENCES FOR VARIOUS TYPES OF EXAMINATIONS*

A. Pathology

Type of examination	Sophomores		Seniors		Int-Res-RG		Overall rank
	Aver.	Rank	Aver.	Rank	Aver.	Rank	
Oral	3.2	(4)	2.8	(3)	2.5	(1)	(4)
Essay	2.5	(1)	2.9	(4)	2.7	(3)	(2)
Objective	2.6	(2)	2.6	(1)	2.8	(4)	(1)
Practical performance	3.4	(5)	3.2	(5)	3.0	(5)	(5)
Some combination of these	2.7	(3)	2.7	(2)	2.6	(2)	(3)

B. Microbiology

Type of examination	Sophomores		Seniors		Int-Res-RG		Overall rank
	Aver.	Rank	Aver.	Rank	Aver.	Rank	
Oral	3.4	(4)	3.1	(4)	2.7	(3)	(4)
Essay	2.5	(2)	2.7	(2)	2.9	(4)	(2)
Objective	2.2	(1)	2.3	(1)	2.4	(1)	(1)
Practical performance	3.6	(5)	3.3	(5)	3.0	(5)	(5)
Some combination of these	2.8	(3)	2.8	(3)	2.6	(2)	(3)

*Highest ranks have lowest numerical index.

TABLE 39

OPINIONS OF STUDENTS CONCERNING GENERAL ARRANGEMENT OF COURSES IN PATHOLOGY AND MICROBIOLOGY

A. Is the quantity of important factual material too great for the time allowed?*

Class	Pathology			Microbiology		
	Yes	No	Total	Yes	No	Total
Sophomores	55%	45%	100%	33%	67%	100%
Seniors	44	56	100	30	70	100
Interns, residents, recent graduates	46	54	100	32	68	100

*High, middle and low achieving students do not differ in their responses to this question. For pathology, the differences between sophomores and the more advanced student groups are significant ($X^2 = 12.56 \sim P < .01$).

B. If you answered yes for either subject above, do you favor spreading the subject matter over a long period of time by having segments of these courses taught in the third and fourth years?‡

Class	Pathology			Microbiology		
	Yes	No	No. answering	Yes	No	No. answering
Sophomores	46%	54%	(441 of 723)	25%	75%	(359 of 723)
Seniors	67	33	(288 of 564)	41	59	(249 of 564)
Interns, residents, recent graduates	81	19	(195 of 357)	54	46	(162 of 357)

‡A number of persons who did not answer "Yes" to item "A," chose nonetheless to reply to items "B" and "C." Their responses are included. Note that percentages are based on the number of persons responding to the item.

C. Do you think teachers should deliberately omit some important information in favor of teaching only representative material?

Class	Pathology			Microbiology		
	Yes	No	No. answering	Yes	No	No. answering
Sophomores	16%	84%	(422 of 723)	22%	78%	(332 of 723)
Seniors	20	80	(283 of 564)	26	74	(240 of 564)
Interns, residents, recent graduates	27	73	(181 of 357)	37	63	(147 of 357)

TABLE 40

STUDENT SUGGESTIONS PERTAINING TO THE ARRANGEMENT OF COURSES IN PATHOLOGY, MICROBIOLOGY AND GENETICS†

A. Pathology

Student suggestions	Of those responding	
	No.	Per cent
No suggestion, satisfied as is	147	29%
Suggestions concerning conduct of course*	142	28
Integrate pathology with other sciences	18	21
Integrate pathology with clinical findings and cases	85	
Extend period of training (in general)	36	19
Extend period of training (to clinical years)	62	
Nonclassifiable responses	16	3
Subtotal	506	100%
No response (15% of total no.)	91	
Total no. students	597	

†The data in this table are derived from the responses of students in a 30% random sample of medical schools in and outside of the U.S.

*Typical suggestions concerning conduct of pathology courses include: Change emphasis of the course, e.g., more gross pathology, less on choice of culture media, more stress on clinical application (26). More fresh specimens needed (17). More lectures and conferences, less laboratory time (16). More explanation, less repetition and detail, better texts (13). Shorter, better lectures (7). Plan courses so there are no summer breaks between parts of the same course (5). Have course earlier (5). Have course later (3). Less drawing (5). More laboratory (2). Most of remainder were purely personal comments, e.g., complaints about specific professors, etc.

B. Microbiology

Student suggestions	Of those responding	
	No.	Per cent
Suggestions concerning conduct of course*	172	36%
No suggestions, satisfied as is	151	31
Integrate microbiology with other sciences	5	14
Integrate microbiology with clinical findings and case study	65	
Extend period of training (general)	22	12
Extend period of training (to clinical years)	34	
Shorten course of study in microbiology	17	4
Nonclassifiable responses	15	3
Subtotal	481	100%
No response (19% of total no.)	116	
Total no. students	597	

*Typical suggestions concerning conduct of microbiology courses include: Change emphasis of course, e.g., more immunology, more stress on clinical application (42). More explanation, less repetition and detail, better text (38). More lectures and conferences, less laboratory (30). Shorter, better lectures (9). More laboratory (3). Less drawing (3). Have course earlier (3). Have course later (2).

C. Genetics

Student suggestions		Of those responding	
		No.	Per cent
Need some course work (have none or only a few lectures)		47	24%
Leave as is (have none or only a few lectures)		16	8
Need more course work		30	16
Integrate genetics training with other course work (e.g., clinical embryology)		38	19
Satisfied—no suggestions		30	16
Suggestions concerning conduct of course		8	4
Nonclassifiable		26	13
Subtotal	(33% of total no.)	195	100%
No response	(53% of total no.)	318	
Have no course (no further comment)	(14% of total no.)	84	
Total no. students		597	

Selected samples of replies from students on integration within and between courses

In the questionnaire, following the items on general arrangement of courses (see Table 40), students were asked to comment on integration within and between courses. The two questions and a selected sample of replies follow. For sophomores and seniors, class standing is indicated in parentheses.

What could be done to improve the integration of laboratory and lecture materials?

A. In pathology

Sophomores (upper third). I take this opportunity to praise and recommend for continued use the laboratory manual describing each slide. It allows detailed study of each slide that time wouldn't permit if the student were left to his own resources.

Would strongly suggest the use of Kodachromes instead of pickled specimens to demonstrate gross pathology.

Devote more time to descriptions of pathologic processes to be encountered before the actual laboratory period.

Sophomores (middle third). Much could be gained by demonstrating patients with particular lesions, giving the students a chance to view living pathology. Also, students should be given a chance to see numerous autopsies.

The use of the clinico-pathologic conference in which whole cases are reviewed has been a great help in integrating and correlating different aspects of pathology.

Seniors (upper third). Increase the use of audiovisual aids. Eliminate compulsory drawing of microscopic sections and devote more time to study of slides.

Perhaps have lecture and laboratory combined so that students can examine slides as lecturer is talking about the tissues. This would allow some flexibility in the proportion of the time spent on one or the other.

More autopsy material in fresh state. Also attendance at autopsies more frequently.

Resident. More time should be spent on commonly occurring disease entities and *less* time on the raritics—also, the student should be *impressed* more with which is which.

B. In microbiology

Sophomore (middle third). Teach the student more on how he goes about doing various procedures not as a lab technician would do it, but as a general practitioner out in practice would handle the problems, and the relationship between a general practitioner and the local microbiological laboratory.

Sophomore (lower third). Often the lab work in microbiology seemed to be unrelated to the important lecture material. Many procedures were demonstrated that I would like to have done myself.

Seniors (upper third). Discontinue compulsory reproduction of microscopic sections in order to have more time to develop proper laboratory techniques and to study the characteristics of pathogenic microorganisms.

Leave out lab procedures that even some microbiologists would never use except when they teach.

More time should be spent on practical clinical problems with case presentations. Much too much time is spent memorizing methods of isolating organisms by fermentation tests, etc. More time should be spent on sensitivity problems, antibiotics and their mechanisms, immunity and immunology.

Senior (lower third). Microbiology was a day-to-day affair with me, and it was extremely difficult at the time for me to understand how the material would help me in the future. Perhaps real practical problems in identification such as unknowns in qualitative analysis would stimulate interest and give some meaning to the lab techniques repeated time after time with very little insight as to future use. Microbiology needs a great deal more correlation to clinical material. This could well be injected into the lab situation by working on throat smears, vaginal smears, etc.

Intern. Some clinical correlation during the second year (re seeing cases in hospital) and some bacteriological correlation in the third and fourth year (re time spent in the lab identifying and isolating bacteria, doing sensitives, looking at smears on your patients).

Recent graduate. As in pathology I believe the best way to integrate lab lectures is in the patient "workup" with the patients especially picked to illustrate the various problems of theory and technique.

What could be done to improve the integration between pathology, microbiology, genetics and other courses?

Sophomores (upper third). Every effort should be made to correlate material between microbiology and pathology so that when a particular bacterial disease is being discussed in microbiology, its pathologic consequences could be covered in pathology. This would cover only a small segment of the pathology course but would improve understanding and retention in both. It is when the student is struggling with the fundamental concepts of a course that such integration would be most useful. On the whole I think our pathology and microbiology courses are well integrated.

First—The responsibility lies primarily with those who are influential in each department. They must first of all develop a respect for other disciplines than their own and openly impart this feeling to the students.

Second—A person who is primarily involved in one discipline by training and holds a teaching position, the responsibility of which is to impart knowledge of the particular discipline, must endeavor to acquaint himself with the fundamentals and present concepts existent in the other major disciplines. This must be a ceaseless, tireless effort. Ignorance breeds contempt, and the student is quick to perceive his professor's feelings, and many students are susceptible to the spirit contained therein.

Third—Forum discussions of various problems by members of different departments serve to integrate different approaches to clarification of the problems. The U. of ..... medical branch has presented forum discussions (panel) and they have met with very favorable student response. More are in order. The bacteriology and pathology departments have been leaders in this type of presentation and they should encourage others to follow suit.

The expansion of pathology into the first semester of the sophomore year, when bacteriology is presented, would not only give more time for digestion of pathology but also correlate etiological agents presented in bacteriology with their effects on living tissue presented in pathology.

Sophomore (middle third). I think these courses and also the correlation of clinical and pathological material are very well integrated in instruction and study in the pathology department here. Student participation in the bacteriological work on autopsy cases helps to correlate clinical, pathological, and bacteriological materials. The clinical summary of each autopsy case studied is used in the presentation of the case to the group. Also, the textbooks used in the course are clinically oriented, including the clinical manifestations of the various disease processes discussed. The student clinico-pathological conferences allow the student to do research on an interesting case and to present such material to the class along with the case material. To me, this is a most impressive method of presenting interesting and useful material. I can suggest no better method of integration than that of our present course of pathology.

Sophomores (lower third). Stop discouraging the second year class from attending the clinical-pathological conferences. There, more than any other place, do we get an opportunity to correlate our knowledge of pathology, microbiology, etc. It is the first opportunity we have of seeing how medical problems are attacked from a scientific viewpoint with regard to the basic principles we learn in our first two years. Much of it passes over our heads, especially the pharmacology and physical diagnosis (early in the year), but much more is gained. The students who do attend regularly try to integrate pathology and microbiology with the case in question. Moreover, we see how physicians handle complex questions with reference to their manner of thinking. It is a very valuable teaching aid, especially from the standpoint of integration.

The greatest integration possible would be the opportunity to follow the course of a diseased patient as he progressed to recovery or death, correlating the specific knowledge which you are accumulating in the classroom with the actual disease process. This makes the disease process a very dynamic thing, whereas textbooks and lectures alone will often result in a poor perspective.

Histology and pathology should be closer together in the curriculum. The time lapse between the two courses permits much of our knowledge of normal histology to be forgotten by the time we get to pathology.

Seniors (upper third). Pathology should

take a more dominant role in the medical school program. A system of lecture material and corresponding lab work well. Microbiology taught as a separate course is also good, but too much stress on "rare birds" is weariness to the bones. It is more important nowadays to correlate pathological process to diseases. Genetics is not stressed enough as a cause in neoplastic, anomalous and degenerative processes; it could best fit in as a subtopic under pathology.

There seems to be considerable enmity between members of the pathology department and the clinical departments of this school. This I believe is based primarily on personality and not on divergence of goals of the various subjects. Such lack of reconciliation of purpose is exemplified by: (a) members of the pathology department here are never seen in the clinical wards. (b) the 'I'll-cut-you-down" attitudes prevalent in the clinico-pathologic conferences. These "teachers" are losing a vast opportunity for teaching.

I would like to see an experiment performed in which lecture periods are presented in such a manner as to have the pathologist, clinician, bacteriologist, etc., all at the same period present to the student what he should basically know about a particular disease and thus prevent much repetition which takes place. This might allow more time for further reading and clinical experience.

Senior (middle third). Integrate, man, integrate—don't be so damned narrow-minded about one field. Forget about the marking system and make it either "pass or flunk." More personal contact with the student—might as well read a book in about 90 per cent of medical schools.

Senior (lower third). The integration between courses was entirely lacking. For instance, we studied viral and rickettsial diseases in three courses over a six-month period. Had the subject been taken up in all three courses at the same time, I am sure that I would have learned a great deal more about it. My suggestion is that the first one to two weeks, or possibly first month, of all the associated courses such as pathological-physiology, pathology, biochemistry, bacteriology and immunology, be spent on basic fundamentals. Then all the specific disease groups could be discussed in the individual courses at the same time. The instructors should get together and be sure the repetition is minimal and that the subject is fully covered.

Interns. As an intern now, I am sure that the laboratory report as to what organism is present in the sputum of any pneumonia patient would mean a great deal more if such aspects of the disease had been presented with the study of pneumonia in physical diagnosis, pathology, medicine, public health, etc., rather than at such time in my freshman year when "pneumonia" was still a word for the future to clarify.

Perhaps I am not completely correct, and maybe it is impossible to have it otherwise, but the only integrating factor between medical school courses that is readily apparent to me—is the fact that they are all covered in one four-year period.

Cut down the formal course and concentrate on integration in the last two years. After our initial exposure to the courses by experts we then go into the hospital where we look at blood smears with the house staff, post mortems with the first year pathologists, sputum smears with the intern. In each of these cases much valuable material and opportunity for invaluable correlation is lost because the teacher is not an expert. Many misconceptions are also passed along. I think more teaching should be done as clinical application of the basic sciences under the direction of the basic science staff. Students instead of the lab technicians could do cultures, sensitivities, etc., on their own patients and could learn considerable bacteriology from them if supervised by a competent bacteriologist. Students could assist the pathologist with posts on their cases and read the slides if they required help from a qualified pathologist and consequently learn a lot more pathology. I think the basic sciences should infiltrate the hospitals the last two years and force the student to apply the finest points of their specialty, instead of the residual, vague information the student or intern remembers of courses without much meaning taught in the dim, hazy past.

Residents. Microbiology—especially bacteriology: While cultural characteristics, biochemical properties, etc., of microorganisms form a necessary basis for intelligent classification (and therefore a framework for presentation to students), I feel all this should be soft-pedaled in favor of the *pathology* produced by bacteria, leading to a description of considerable *clinical* material. The pathology department is busy enough with its broad subject and should relegate to the bacteriologist the job of giving detailed presentation of the

disease processes initiated by the microorganisms, including fungi. Recalling personal experience, it seems that pathology touched the subject too lightly, and bacteriology spent most of the time in the nebulous blue yonder telling me things I have never put to practical use. *Example:* I was half way through junior year before I had it spelled out for me that *"syphilis is an arteritis,"* and this from a clinician. Bacteriology had impressed me with a somewhat confused picture of the *incidence* (!!) of syphilis in Army camps in World War II. Pathology confused me with a description of the various luetic manifestations in different systems. This may all be due to personal fallibility, but I think mine was an average experience.

If possible, I believe it would be good to have occasional movies showing bacteria, their growth characteristics, colony formation, sites in body where major pathology is found and results of same. These could be viewed at weekly intervals by all of the classes at one time. I do *not* believe there should be large seminars with clinicians, radiologists, surgeons, pathologists, etc., as the student is not far enough along to put the discussion in the right perspective. He would have a tendency to learn symptoms, x-ray changes, surgical techniques and tend to neglect the basic cause and pathological change. The above program is good for graduates, but not for the preclinical student.

Recent Graduates. I am inclined to favor the type of experiment being done at Western Reserve University in which the entire approach to teaching medical students concerns integration of the basic sciences with clinical medicine. Perhaps their approach is too extreme to be practical, but in my opinion it is a step in the right direction.

Ideally, basic science teachers should be M.D.'s as they can guide the medical student much better. Frequently lack of integration is due to the fact that the subjects have been focused from a "dry" or absolutely scientific point of view, without realizing that the aim of the medical student is the practice of medicine and that he will retain better that information which can help him later.

General comments of students

On the last page of the questionnaire students were given an opportunity to comment on items and to suggest topics for discussion at the Institute. A selection of representative comments has been made from the hundreds which were offered. These comments are reproduced below.

Sophomores (upper third). I think a subject which deserves consideration is the matter of lecturing. This does not apply only to pathology, microbiology or genetics, but to any course. In my opinion, there are three types of lecturers: (a) Those who, having to talk on a vast subject in a relatively short period of time, get prepared to do so and cover skilfully as much of the material as possible, giving a nice idea of the subject to the student who is now in a position to go to the textbooks and references and get a lot out of them. (b) Those who, trying to cover as much of the material as possible, give such a general idea about everything that they talk about nothing, failing completely in delivering anything to the student. (c) Those who, overwhelmed by the great amount of material and the short time, or by other reasons, don't even attempt to lecture but simply turn over the job to the student who suddenly finds himself in the status of lecturer and student. If the last two constituted the attitude of all professors, then one would think—why have lectures, why go there, why not use that time in the lab or in studying the same subject which was scheduled for the lecture and thus, get the best out of that time? The lecture is needed, as are lecturers of the first type described, because the lecture is like the key which opens the door to a new world, thus facilitating the entrance to the traveler. It's not because he is unable to get through without the aid of the key, but because otherwise he would have to climb over the wall and in doing so he might get bruised. And if this can be prevented, why not use the key?

I believe the instructor's job consists of the following: (a) he should indicate the necessary rate of progress, (b) he should point out areas to emphasize in study, (c) he should point out the authorities and sources of information on the topics studied and (d) he should clear up points of confusion when questions arise. Above

all *he should not* take the time to lecture on readily available information.

We have come to the point where so many courses have been thrown into the sophomore year that a new problem has arisen. In order to do justice to each course the student is forced to spread his concentration and attention over too wide an area. As a consequence the concentration and attention have been thinned out to the point where the student is possessed of *mediocrity in everything but excellence in nothing.* This, to me, is the greatest problem that faces both modern medical educators and medical students.

I was so deeply impresed with the value gained from autopsies which I attended and reported on that I feel it would be wise to consider enlarging on that part of the course in pathology. This is much stronger clinical correlation than clinical correlation *lectures.*

The profession of teaching is a noble one, but it finds small honor in medical school. Research and the goals of scientfic research have so captivated the imaginations of staff members that the tendency is strong to heavily depreciate men whose only real accomplishment is the advancement and inspiration of successive generations of medical students. On the other hand, men whose research contributions have been brilliant may be without the slightest gift as teachers. The two professions, scientific teaching and scientific investigation, are not mutually exclusive. Success in either field does not mean that a man should eschew the other. If, however, a man be admirably well qualified in one profession and not in the other, some separation should be made, so that his talents could be fully exploited without the continual exposure of gross and embarrassing ineptitude.

We need a short, basic course in *human* genetics, teaching us the mechanisms of heredity as they apply to humans. For God's sake, *forget* the fruit flies.

Lectures should be a learning experience. Most often, even with good teachers, lectures are merely a dictation session in which the student compiles a set of notes to study, so to speak, in his spare time. Instead of this, I feel the instructor should use the lecture hour to teach and get ideas across. In two years of medical school I have only experienced such lectures in one, or perhaps two, courses. The detailed notes if necessary could be given out in mimeographed form, and the student then could devote his attention to listening and understanding rather than writing.

Lecture notes: It is suggested that students be presented with a summary of lecture material by the departments concerned, so that lecture periods may be spent attending to what is being said. Much of the emphasis and perspective of a lecture could in this way be procured, besides making lectures more stimulating and doing away with the errors made in rapid note taking.

Sophomores (middle third). I feel that one could derive the greatest benefit from lectures if it were unnecessary to take notes—yet the threat of examinations and the sense of competition make it essential that one's energy be directed after the material presented, hence vigorous note-taking. The department of anatomy has published a "workbook" which permits one to listen, and think, with a sense of security. The students themselves have produced mimeographed notes on the courses in pathology and medical bacteriology, and the ready sale of these notes (at no small price) indicates that my sentiments are by no means unique. I would like to see departmental notes, at least of an outline nature, made available at cost. It is agreed that the taking of notes gives the student a ready reference, one characterized by incompleteness, errors and misunderstandings.

I believe that only inspiring teachers will inspire students in the direction of a teaching specialty. It is not true that my class has had much better teachers on the clinical side, but we have had some who are persuasive and believe, for a large part, that it is not too early to begin to direct the student's attention to the clinical specialties. When the student's interest is not specifically jogged in the second year by the basic sciences and their place in the diagnosis and treatment of patients, he is too apt to believe that these sciences are only academic, and he will leave them to the Ph.D.'s and the technicians. The student should have the benefit of the experience and knowledge of senior staff members more often than he does. This is very true in microbiology in which much of the course, particularly the labs, are so often taught by nonclinical people who have not had the opportunity of finding out what the medical student is going through in the first two years. Students must be given some idea of the clinical side of pathology and microbiology before the pedi-

atricians and internists grab them off in order to dispel the notion of the "ivory tower" aspect of the laboratory sciences. I know a good half of my class see nothing interesting in becoming a physician in order to be a king-size laboratory technician afterward. They develop this attitude because they have not been shown the whole picture. By the time they see it at CPC in the third year their loyalties are already moving elsewhere. I think it can be remembered that some of the greatest members of the other professions were given constant prodding in their vocation for their specialties and didn't spring fully dedicated from Jove's brow. It is pathology's and microbiology's ill-luck that they meet their future members in the second year, and to persuade men into these two specialties they should be the two best-taught, most interesting courses in the entire curriculum. Pathology must have plain recruitment first before they have all the teachers they need.

My objections to the medical curriculum are several-fold, and I am glad for this opportunity to express them. As I have noticed it, there seems to be a prevailing attitude among instructors that we were forced into medicine, and they are, therefore, compelled to keep a watch-dog attitude over us all the time with frequent examinations (usually on an objective basis) to test us over minutiae and generally to instill in us a dreadful fear that we are going to flunk out—or could. This underlying philosophy is wrong. I (and I think I speak for 99 per cent of my class) came into medical school because we were in love with medicine. Now it is well known that a man doesn't have to be pushed to do something he already wants to do. We don't have to be forced to study the important anatomy of the arm, but we do resent *wasting* our time, studying the insignificant details of medicine just to pass a test so we won't flunk out. We abhor the fact that we have spent hours studying material which has no clinical significance when we could have used that time to great advantage. Perhaps you can't do anything about this, but couldn't there be an effective student appraisal of each instructor at the end of each year? By effective I mean one that *could* relieve a man from the teaching staff. There are instructors that I and others have met in almost all the departments who have contributed greatly in making an otherwise interesting course a drudgery.

The most significant topic in this questionnaire to me is the one concerning informal conferences with the staff. I believe these conferences would benefit the students immeasurably.

I strongly suggest that you recommend to the Institute that similar questionnaires be used by each medical school in evaluating their courses.

Grades: Too much emphasis is placed on the importance of high grades, often to the detriment of the student. To my experience, this has been the case in undergraduate school and to my disappointment, in medical school. Competition between students isn't the problem; the basis of the competition is so relative (i.e., grades) that it only adds to the burden of frustrations and anxieties which beset the medical student. To me personally this is a tremendous problem, and I would be overjoyed if some kind of a system as "Satisfactory—Unsatisfactory" were instituted.

I think that one subject for discussion at the Institute should be the problem of students in the preclinical years who often feel that they are added baggage and that some of the staff would be quite happy not teaching them at all. Students in the first two years of medicine I think must be made to feel that they are an integral part of the medical school and not just a group to be tolerated until passing on to the clinical years. Medical students feel acutely the need for a little voice in affairs concerning them.

Another subject in which I feel a great deficit is that of epidemiology, medical statistics, applied human genetics and preventive medicine in general. An integrated well-rounded course including epidemiology, medical statistics (vital and economic), and applied genetics could be given in the sophomore year possibly. Preclinical teaching of neuropsychiatry might be another subject the Institute could discuss. Present courses do not seem to prepare us adequately.

Sophomores (lower third). Why in most cases, do teachers try to impress on students the importance of basic fundamentals and then on their exams emphasize the minutiae? Why the dichotomy? Which point brings to mind—what is the real reason for exams?! To get a grade-spread? It appears that way. If it is to teach the student (as some people say it *should* be), why aren't the exams reviewed and stumbling points brought to the attention of the students?

I have found by my own experience that I gain a more thorough understanding of some certain aspect of material when it is discussed as it was in our pathology conferences, the advantage being that the

group is usually limited to a small number. One is inclined to remain silent in the classroom when a question arises in order not to disrupt any lecture which is being given. This incomplete understanding of some certain point may lead to an inability to follow the remainder of the lecture intelligently.

The examinations as given now serve only to cause the student to lose sleep during examination week. The exams in bacteriology are so detailed that a student can memorize details, pass the exam and not understand anything. As far as rating or grading students they show only the differences in ability to cram.

Yes, like Senator Claghorn, "there is one topic that is dear to my heart." It is the topic of attitude. A student will never make a good doctor, pathologist, microbiologist, or even a man without the proper attitude. If he has the brains and manual dexterity he may make a body mechanic, but not a physician, unless he has had instilled in him somewhere along the line respect for the dignity of his fellow man. It seems to this student the height of stupidity to fail a student who works his heart out and can't make it (usually one, two or a very few more opinions), and pass a student who sneaks out of class, cuts lab and generally gives the class a bad name, yet can make the grade. Any man who is too smart to meet class is too smart to be in medical (or any graduate) school. A doctor must have brains, but more important he must have correct attitude. It is corny, but it is true!!!

Seniors (upper third). Why not discuss the possibility of making medical college a five-year course and premed only three years? My only other comment--more departments should go out of their way, as our department of pathology has, to make available materials and supervision for research exercises over short periods of time for students. This would of necessity be purely voluntary but should be vigorously encouraged.

Do not believe average medical student is well enough versed in research and research methods to evaluate investigative literature. Believe that a course in research methods and statistics would overcome this difficulty. Or a short portion of each course in basic sciences could be devoted to this.

I think that all lectures in medical school should be outlined by the instructors, printed and sold to the students. Medical terminology is so complex and difficult for the novice to take notes that the continuity of lectures is often interrupted. If the student could go to class and simply listen to the lectures without taking notes, his comprehension would be so much better.

One topic of irritation to me is the tendency for many professors to voice an abhorrence of "spoon feeding" to cover up their own lack of organization and preparation of the material or insufficient command of the subject. A concise, well organized and prepared, adequately presented lecture *is not* "spoon feeding." The student has not the familiarity with the source material to adequately orient and compile much information. A professor is valuable in teaching only insofar as he is able to give meaning and organization to the material confronting the student. The student could attain the textbook facts from a correspondence course.

Microbiology in office practice is pretty hazy. More detailed information should be given as to cost, availability and practicability of a miniature bacteriology lab for the G.P. who is not located in the city where lab facilities are available. The lecture material is at times too classical for the busy medical student to become very interested in it. Completeness at times seems to be the paramount interest of the professors, and ofttimes much more important material is skipped over.

I believe that there is a real problem which should be a topic of discussion at the Institute, and I have hinted at it in my answers to the foregoing questions. It revolves around the prevalent tendency toward "specialization" in medicine and the concept that no one man is "big enough" to handle by himself a whole subject in medicine. Consequently, departmental directors fully cognizant that they do not know "everything about everything" in their field relegate frequently as much as 75-80 per cent or more of the subject material to specialists in the respective topics. The factors contributing to this trend in medical teaching are undoubtedly many. However, a possible primary factor is the stringent demand for an active research program placed upon department heads by most leading medical schools. Such time-demanding activities stimulate this tendency to reduce active participation in teaching by the department head.

To the student the above mentioned tendency towards specialization has the effect of presenting him with an uncorrelated conglomerate of cubicals of information with many loose ends often unrelated to each other or to any work he may be doing in the laboratory. He is left to his own re-

sources to fit them together, to make some sense of them, and to come out with some concept of the whole, which he hopes may resemble that of his professors. I think he frequently loses much in the organization of the melee.

In my experience I have had courses of equal scope taught by both methods. The course in which the responsibility rested with one man for giving a well-rounded course, including a majority of the lecture material and its correlation with laboratory or clinical material, resulted in the presentation of a more unified whole which I could use as a base from which to expand my knowledge in any chosen direction.

The criticism that "no man is capable," I believe to be inadequate from the student's standpoint. The student needs the simpler, more general overall picture in its proper proportion—that which I think most every department head has within himself—rather than the concept of multiple specialists. That which will be omitted in the general picture is much less important and much more easily grasped at a later date when the full picture is in view.

Seniors (middle third). One of my most valuable experiences in microbiology was an accident, and the idea may have no value in a teaching program but I'll offer it for what it's worth. One of the young monkeys in the animal quarters was critically ill. No one was especially interested in it or had time to work with it. With permission I made a study of it and decided from slides of feces that it had *E. histolytica* and treated it with terramycin, vitamins and iron with good results. All this involved a good bit of reading, consulting bacteriology for help with the slides, staining, etc., consulting the pharmacology department for the least toxic drug, figuring out an acceptable vehicle for the stuff (chocolate milk worked best), etc. I learned more pharmacology and parasitology and remembered it better than from any other single experience in med school.

I recognize now that thorough grounding in the humanities is quite desirable. I hasten to point out, however, that my attitude toward these subjects while I was in freshman year of undergraduate training was not so tolerant.

Too little emphasis in microbiology is placed on the ordinarily found normal and semi-normal flora. I have more knowledge of *cholera vibrio* and some tropical diseases than I have concerning the pathogenicity or lack of same of organisms reported on routine throat, blood and urinary cultures.

The course I took in pathology was the best in my first two years—mainly because the lectures were mimeographed and distributed at the beginning of the course, and the lecture time devoted to introductory remarks, visual demonstrations of microscopic slides and pathology specimens, group and individual conferences.

There is *too much* fear of *failure* in medical school today—which fear causes *more* failure than lack of ability.

Seniors (lower third). I think the Institute might seriously evaluate the teaching of psychiatry. I think it would be profitable to have available psychiatric personnel to guide students in the treatment of ward medical and surgical patients. At the same time less time would be spent with psychotic patients.

In the years since the invention of the slide projector and the motion picture, the field of education in general and medical education especially has taken to itself this crutch to prop up the weak lecture and the shaky theory until they have become, indeed, cripples. Anything which can be made into a slide assumes the authority, to the lecturer at any rate, as that which was carved on the tablets given to Moses. Instructors ever cognizant of the cost and work of producing slides crowd each one with as many details as they can. The resultant mass of data and curves does nothing to clarify and much to confuse.

I once heard the suggestion that perhaps the cure for this crippling disease of the teaching medical profession would be that universally, whenever the lights were turned out in a lecture, the group leave in a body. This would leave the lecturer with his hobby to show the slides to his heart's content. Of course, this is a bit drastic, and there is a place for the use of lantern slides in the lecture, but I believe that this group might profitably study the situation and determine what this place might be.

The alternative to reform is the development of a single continuous sound movie which would run for the whole four years while the medical student wandered in and out, and the medical teacher could be, thus, freed to devote his whole energies to research and the development of more and longer movies.

If this comment sounds bitter, it is because I am bitter about the hours I have spent in the dark while so-called lecturers basked in the glow from the projection screen. The group sponsoring this questionnaire are not accused by me of being either the worst or the only offenders. . .

Interns, residents, and recent graduates. In the estimation of the upper classmen in medical school, pathology and microbiology assume more importance than any previous courses in the actual understanding of the ward cases which they study. I would like to add that it is my opinion that neither course should be taught to medical students as a separate endeavor or entity and that for pragmatic reasons they must be primarily directed toward their utilization in clinical medicine. For example, studies of saprophytes should only be introduced when a knowledge of them is necessary for the understanding of pathogens. Minutiae about rare pathogens should be dispensed with for the purpose of emphasis. However, it is readily admitted that it is difficult and at times impossible to draw a line as to the importance of material. Finally, it is suggested that microbiologists and pathologists participate to a greater degree in the teaching of clinical medicine in the last two years so as to avoid misunderstanding on the part of the student as to the fundamental processes in his patient.

The incorporation of the basic scientist into the general life of the medical center should be discussed. Too often your microbiologist, physiologist, etc., stays within the confines of his department's teaching program and does not participate in the general staff conferences, combined clinics, etc.

In microbiology possibly some slides of wound infections, pus at the base of brain on autopsy, or some little thing to stir the imagination when studying the various bacteria would help. The whole idea is to give the student just a taste of what is needed clinically to make him correlate.

I suggest the Institute consider possibilities of allowing students during their second and third summers or during their third or fourth years to pursue research projects in one of the basic sciences (anatomy, physiology, biochemistry, microbiology or pathology). This could serve to initiate students into research and scientific writing as well as stir interest in those subjects which are the bases of medicine.

All research work and problems encountered by the staff in microbiology, pathology and other basic sciences should at some time be presented to the students in order to gain prestige for the staff members, stimulate research among students, point out the many difficulties encountered and help the student interpret research work done by other institutions.

I believe more time should be allotted to the study of immunology and genetics. I am sure most students after graduation from medical school seem somewhat deficient in these topics, especially immunology.

Perhaps more time should be given to courses such as autopsy. In a course such as this, there is an excellent opportunity for integration of pathology, microbiology and genetics. Also, such a course invites student participation and preparation, and some of the formal air of the classroom is removed.

Medical education is much too static. Since the goal of medical schools is primarily to train clinicians, the schools should keep abreast of the problems of the clinicians. For instance we spent an hour of our clinical year discussing cholera—the last epidemic in Wisconsin was in the mid 1800's—and only two hours during the entire four years discussing psychosomatic aspects of medicine. We spent about an hour discussing the important economic aspects of the care of the patient.

I believe that all the work in pathology subsequent to the introductory course should be in the form of small discussion groups with one faculty member to lead the discussion. I believe the subjects discussed should be flexible and based on material from the literature with emphasis on the controversies, the experimental methods, and the theoretical implications of the conclusions.

I believe the students should be encouraged to do research on their own. They should also be encouraged to participate, even if only from the point of view of an observer, in the research being done by various members of the staff.

Appendix 3

List of Participants

The participants of the 1954 Teaching Institute are listed below. In addition, the Coordinators of Cancer Teaching took part in the discussion on the last half-day of the Institute.

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Appendix 4

References

The geneticists on the planning committees selected for display at the Institute a number of books and journals in the field of human genetics. The annotated bibliography which accompanied the exhibit is given below.

A selected list of pertinent articles on medical education published during the last five years is also given.

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An outstanding treatment of the problem of, and evidence for, organic evolution.

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2. *The American Journal of Human Genetics.*
3. *Annals of Human Genetics.*
4. *Eugenics Quarterly.*
5. *Opera ex Domo Biologiae Hereditariae Humanae Universitatis Hafniensis.*
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